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3.1 INTRODUCTION

The Salton Sea Unit 6 Project (SSU6 Project) consists of a proposed geothermal Resource Production Facility (RPF), a merchant class geothermal-powered Power Generation Facility (PGF), and associated facilities in Imperial County, California. Figure 3.1-1 shows the project regionally, and Figure 3.1-2 depicts the project area, including proposed transmission lines and pipelines. The SSU6 Project will be owned by CE Obsidian Energy LLC (the Applicant), and operated by an affiliate of the Applicant, except for the transmission lines, which will be owned by the Imperial Irrigation District (IID).

The RPF includes geothermal fluids extraction (production) wells, brine and steam handling facilities, a solids handling system, two brine ponds and injection wells (Figure 3.1-3). It also includes steam-polishing equipment designed to provide turbine-quality steam to the PGF. The PGF consists of one geothermal power block. The PGF includes a condensing turbine/generator set, the gas removal and abatement systems, and a heat rejection system. The PGF also includes a 161 kV switchyard and several power distribution centers. Common facilities include a control building, a service water pond, and other ancillary facilities. The PGF will include a multi casing, triple pressure, exhaust flow condensing turbine. Heat rejection for the steam turbines will be accomplished with a counterflow cooling tower. The steam turbine generator (STG) will be nominally rated at 200 megawatts (MW) and net output of the facility will be 185 MW. Geothermal steam from the RPF will be the only fuel used by the STG.

Geothermal fluid will be produced from 10 production wells located on five well pads near the power plant (Figure 3.1-4). The fluid will flow through above ground pipelines to the steam handling system adjacent to the power block. At the steam handling system, the geothermal fluid will be separated from the steam phase (flashed) at successively lower pressures to produce high pressure (HP), standard pressure (SP), and low pressure (LP) steam for use in the STG. Chemically stabilized brine flows from the steam handling system into the solids handling system where solids are removed, after which the brine is suitable for injection. The spent fluid (brine) is then pumped through the injection pipelines to seven brine injection wells. All production and injection wells will be operated in accordance with California Division of Oil, Gas and Geothermal Resources (CDOGGR) regulations.

Steam from the RPF will be treated to remove impurities, after which it will be delivered to a triple-pressure condensing steam turbine. Non-condensable gases (NCG) from the surface condenser will be treated and then directed to the cooling tower.

Electricity generated by the SSU6 Project will be delivered to an existing IID electrical transmission line (L-Line), via the proposed 161 kV L-Line Interconnection, and ultimately connect to the existing El Centro and Avenue 58 substations located west of the project site. Additionally, the proposed IID Midway Interconnection Line will connect to the existing IID Midway Substation located east of the project site (Figure 3.1-2).

The project will supply capacity and energy to California's electric market, and the Applicant has contracted over 85 percent of the plant output with the IID for a period of 20 years following project completion. The remaining energy will either be sold to the California Independent System Operator (ISO) or contracted to third parties via the IID.

The location and the configuration of the plant have been selected to best match operating needs and the available geothermal resource. A System Impact Study completed by IID concludes that very minor transmission upgrades are required (see Section 3.3.6).

3.2 SALTON SEA GEOTHERMAL RESOURCES

3.2.1 Regional History of Geothermal Resources

The Salton Trough is a 3,100-square-mile geological structural depression that extends from the Transverse Mountain Range on the north to the Gulf of California on the south. The Peninsular Mountain Range forms the western boundary, and the Colorado River forms the eastern boundary. The Salton Trough is a seismically active rift valley where sedimentation and natural tectonic subsidence are nearly in equilibrium. The California Division of Mines and Geology recognizes the Salton Trough as an area with thermal water of sufficient temperature for potential geothermal energy development. Distinct geothermal anomalies are distributed throughout the Salton Trough, where hotter fluids suitable for electric generation are accessible (Imperial County General Plan, Geothermal/Transmission Element, 1993).

The Salton Sea field has been known to have significant reserves since oil and gas companies first discovered the field in 1958 during exploration. The Salton Sea Known Geothermal Resource Area (KGRA) includes 161 square miles (102,887 acres). A "known geothermal resource area" is an area in which the geology, nearby discoveries, competitive interests, or other indicators would, in the opinion of the Secretary of the Interior, engender a belief in those who are experienced in the subject matter that the prospects for extraction of geothermal steam or associated geothermal resources are good enough to warrant expenditures of money for that purpose. (30 U.S.C. 1001).

The Salton Sea is a known geothermal resource area as defined by the United States Geological Survey (USGS). The USGS has designated nine KGRAs in Imperial County, including the Salton Sea (Imperial County General Plan, Geothermal/Transmission Element, 2001). The CDOGGR has also designated the Salton Sea as a geothermal field.

Development of the resource was slow in the 1960s and 1970s because of the technical challenges associated with processing of the unusually aggressive hyper-saline brine. Unocal Geothermal, Magma Power Company, and various governmental agencies overcame these challenges. Commercial operation of the Salton Sea field began in 1982 at Unocal's Unit 1 power plant and in 1986 at Magma's Vulcan plant. Since then, four additional generating units have been added in the original Unocal development area, and four additional generating units have been built in the original Magma area (Table 3.2-1). Both of the original development areas and all plants in the field are now operated by affiliates of the Applicant.

Only 4,808 acres of the 102,887 resource acres of the Salton Sea KGRA are currently developed, and that acreage supports the generation of approximately 350 gross (326.4 net) MW. The proposed SSU6 Power Plant Project will add 3,180 resource acres to development and support nearly 200 gross MW of additional electric power generation. Table 3.2-2 summarizes the acreages of project components.

3.2.2 Project Site Selection

The geothermal facilities, as proposed, incorporate the most feasible and practical layout for the generation of geothermal energy from the Salton Sea Geothermal Field (Field). The Obsidian Butte area proposed for development by the SSU6 Project contains proven reserves. The proposed well field and plant site layout provides the required energy production using the available acreage, at the closest spacing possible without undue interference between wells, while sustaining production over the life of the project. Geothermal leaseholds are shown on Figure 3.2-2.

The Salton Sea Field is bisected by a main blind fault that extends up into the overlying sedimentary formations and runs west-southwest to east-northeast. The main blind fault is described in Section 5.2 and illustrated on Figure 3.2-1. Reservoir temperatures increase northwest of the fault, while brine temperatures become cooler south of the main blind fault and cannot support geothermal energy production. Wells that gather the hot brine from which the electricity is generated (production wells) are north of the fault. The production wells would have average flow rates of about 1.5 million pounds an hour at wellhead pressures of 375-425 pounds per square inch at wellhead temperatures of 450-480 degrees Fahrenheit. Production wells would be drilled to an average total depth of about 7,400 feet. Wells where spent brine would be injected back into the ground (injection wells) are south of the main blind fault and will have an average injection rate of 1.375 million pounds per hour of brine at a temperature of about 230-240 degrees Fahrenheit. Injection wells would be drilled to a total depth of about 8,725 feet.

Reservoir properties of the hyper-saline brine in the Unit 6 area are expected to have downhole temperatures of 550-600 degrees Fahrenheit and a total dissolved solid content of approximately 23.5 percent with non-condensable gases of 0.34 percent. Dissolved solids consist primarily of chloride, sodium, calcium, and potassium. There are also significant amounts of zinc, manganese, iron, and silica dissolved in the brine. The major component of the non-condensable gases is carbon dioxide. There is a large variety of other components in the brine, although the other components are less than 0.3 percent each.

A large part of the Salton Sea geothermal field lies under the waters of the Salton Sea. In fact, the hottest part of the resource is under the Salton Sea. The SSU6 Project would develop the remaining acreage on the shallower western end of the field that is still on land, between the developed part of the field and the hotter part of the field under the sea. However, the inaccessible acreage that is offshore does provide pressure support to the field and additional longevity to the developed part of the field. Without the SSU6 Project, the Salton Sea field would be substantially underdeveloped.

Wells are sited to maintain the renewable nature of the geothermal resource. Proper distance must be maintained between production areas to ensure the production wells receive adequate pressure support to maintain their productivity. Similarly, production and injection areas also must be properly spaced. For instance, in the western portion of the Field, production and injection occur close together because the main blind fault is considered a sealing fault, or diffusion boundary. East of this portion of the Field, the main blind fault is not considered to be a sealing fault, so additional distance is needed between production and injection wells. Additionally, injection and production must be planned so that injection occurs at a structurally lower level than production as gravity will work to force the heavier cooler fluids under the hotter less dense fluids to heat up before proceeding to the production wells, preventing premature breakthrough. The drainage areas and injection areas for the existing power plants are shown on Figure 3.2-1, as are existing condensate and/or pond injection areas.

The general principles used in locating the wells for the SSU6 Project are as follows:

- Production wells would be located north of the main blind fault.
- Development would be as close to the main blind fault as possible.
- Separation would be maintained between production and injection wells to prevent premature breakthrough of injection fluids.
- Production wells would be spaced apart to prevent any decline in the production rates for existing geothermal plants.
- Wells would be spaced to ensure adequate resource to support required production rates for the life of the proposed project. Only two wells would be allowed per pad, to prevent/limit interference between wells at the casing shoe. Well pads would have adequate distance between them to prevent interference.

3.2.2.1 Individual Well Pad Locations

There are 10 proposed production wells, to be located on five well pads, and seven proposed brine injection wells, to be located on three well pads.

Production Well Pad OB5 would have two wells that would fully develop an undeveloped area between the existing facilities in Region I and Region II that is not in the primary drainage area of any currently producing wells (see Figure 3.2-1). With both Region I and Region II production wells pulling on this area, it is critical not to overdevelop this area.

Production Well Pad OB4 (on the plant site) would have two wells that would drain remaining undeveloped area between Region I and Region II and the area just off the northwestern edge of Region II.

Production Well Pad OB2 (just north of the plant site) would have two wells that would drain the area just off the northern edge of Region II.

The above listed well pads are all adjacent to existing plant well fields. Reservoir modeling has determined that bringing these wells any closer to the existing plants or additional new project wells would severely impact the decline rates of existing wells and other proposed project wells. Additional resource must therefore come from a second tier of wells located farther away from existing production.

The four remaining wells would be drilled from pads located farther outside the first tier of target zones, to allow the reach of the wells to extend far enough to avoid interference with the drainage areas of other wells.

Production Well Pad OB1 would have two wells that would drain acreage that is critical to providing the proper amount of resource to support the proposed plant. Production Well Pad OB3 would have two wells sited to allow drilling a sufficient distance from existing production areas. It would be impossible to reach west beyond the drainage area of the wells without putting a well pad on Obsidian Butte. Draining this acreage is critical to having the proper amount of resource to support the proposed plant.

The brine injection area was sited south of the main blind fault and at an adequate distance from existing or proposed production wells, in an area that would not be considered for production, yet is close enough to give pressure support. While the development of the SSU6 well field northwest of Region II lowers the pressure support to Region II, the addition of the SSU6 injection to the southeast will increase pressure support to the existing Region II, balancing the pressure support lost from the new northwest production development.

While Figure 3.2-1 shows graphically the basic interaction of the drainage areas of the wells, it is a simplification of the reservoir dynamics. Reservoir properties vary in lateral distance and depth, and are interdependent. The reservoir properties and response of production of the Field have been mathematically modeled and history matched to existing data from over 10 years of production. The layout of the proposed SSU6 has been entered into this numerical model to forecast its effect on the reservoir and existing well fields over the life of the plant. Location, spacing, production rates, and pressure support have been balanced to provide the optimum well field for SSU6 using the above criteria. The numerical modeling results support and were used to develop the discussion above.

3.3 FACILITY DESCRIPTION

3.3.1 Overview

The project is composed of a RPF, a PGF, and ancillary facilities. The SSU6 Project includes a high efficiency condensing steam turbine with a net plant output of 185 MW with corresponding brine production rate of 12,815 kilopounds per hour (kph). Normally, the facility will be operated in a base load mode: 8,000 hours per year or more. The design of the RPF is based on crystallizer reactor clarifier technology (described in Section 3.3.2.2) to process the brine and produce turbine-quality steam.

The RPF includes all the brine and steam handling facilities from the production wellheads, through the crystallizer/clarifier system, to the injection wellheads. It also includes a solids handling system for brine solids processing, a brine pond, steam polishing equipment designed to provide turbine-quality steam to the PGF, and appropriate steam-venting vessels to support operations during startup/shutdown and emergency conditions.

The PGF includes a condensing turbine/generator set, the gas removal and abatement systems, and the heat rejection system. The PGF also includes a 161 kV switchyard and several power distributions centers. Common facilities include a control building, a service water pond, and other ancillary facilities.

The PGF will include a multi-casing, triple-pressure, exhaust flow condensing turbine. Heat rejection for the steam turbines will be accomplished with a counterflow cooling tower. The turbine generator will be nominally rated at 200 MW with a net plant capacity of 185 MW.

Figures 3.3-1A and 3.3-1B illustrate the arrangement at the RPF and PGF. Appendix F lists major equipment and significant structures required for the RPF and PGF configurations.

The SSU6 Project will be located in the unincorporated area of Imperial County, California, approximately 5 miles northeast of the town of Niland and approximately 4 miles from the town of Calipatria. The site vicinity includes existing geothermal facilities and developed agricultural lands. This location and configuration of the plant have been selected to most effectively and efficiently use the geothermal resources at the site.

3.3.1.1 Site Access

The proposed plant site can be reached via either State Highway 86 or State Highway 111 on existing roads. Upgrades to existing road, if required, are expected to be minor. From both Highway 86 and Highway 111, access to the plant site will be via Gentry Road. From Gentry Road, access is west via McKendry Road. Auxiliary access is also provided along the south edge of the facility. Details are presented in Figure 5.10-2, in the Traffic and Transportation section.

Production and injection well pads are on or near the plant site. Except for one production well pad (OB3), as shown on Figure 3.1-4, all well pads are adjacent to existing roads.

3.3.1.2 Site Location

The SSU6 site is in the Imperial Valley, southeast of the Salton Sea. The Imperial Valley is the southwest part of the Colorado Desert that merges northwestward into the Coachella Valley near the northern shore of the Salton Sea.

The power plant will be located on approximately 80 acres (Plant Site) of a 160-acre parcel (APN 020-110-08) within the unincorporated area of Imperial County, California. In addition to the two injection wells and two production wells that will be located on the plant site, the remaining eight production wells (four well pads) and seven injection wells (three well pads) will be located off site (see Figure 3.1-4). The plant site is the northern half of the block bounded by McKendry Road to the north, Severe Road to the west, Peterson Road to the south, and Boyle Road to the east. The construction area, including laydown and parking, is approximately 25 acres and will be located immediately adjacent and south of the plant site. The lot will not require subdividing. The plant site and construction laydown area is currently agricultural land. The 160-acre parcel is owned by Imperial Magma LLC, an affiliate of the Applicant. The Applicant will lease the construction area temporarily and will have an option to lease the plant site permanently. The elevation is approximately 228 feet below sea level. The proposed 160-acre site is in the Obsidian Butte quadrant of Section 33 Southwest ¼, T 11 South, R 13 East (Figure 3.1-2). Figures 3.3-2A through 3.3-2E show Section, Township, and Range; Assessor's Parcel Numbers (APN); and leaseholds for the plant site and all ancillary and linear facilities.

The SSU6 project site is in a region of the Imperial Valley characterized mostly by agriculture and geothermal power production. The surrounding area is dominated by agriculture.

The town of Niland is approximately 7.5 miles northeast, and the town of Calipatria is approximately 6.1 miles southeast of the plant site. The Sonny Bono Wildlife Refuge

Headquarters is approximately 4,000 feet from the plant site. The Alamo River and New River are approximately 4.8 miles southwest, and 2.7 miles east of the plant site, respectively. Nine geothermal power plants are within a 2-mile radius of the proposed plant site. Units 1, 2, 3, 4 and 5 Geothermal Power Plants (Region 1) lie to the southwest, while the Vulcan and Hoch (Region 2) Geothermal Power Plants lie to the southeast. The J.J. Elmore and Leathers geothermal power plants are to the northeast.

3.3.1.3 Site Layout

The layout of the proposed facility is illustrated in Figure 3.3-1B. Site cross sections are shown in Figures 3.3-3A and 3.3-3B. A plant site rendering and isometric view of the facility is depicted on Figures 3.3-4 and 3.3-5, respectively. A before and after plant visual rendering is provided as Figure 3.3-6

Approximately 80 acres of land will be required to accommodate the plant facilities, which comprise the turbine/generator area (400 feet × 500 feet), RPF separator/crystallizer/scrubber/ brine clarification area (400 feet × 700 feet), electrical/control building area (300 feet × 500 feet), cooling towers (a total of 20 cells, 1,400 feet × 140 feet), filter press area (200 feet × 200 feet), electrical switchyard (300 feet × 300 feet), brine pond (two ponds, 800 feet × 90 feet each), service water pond (136,000 square feet), stormwater detention pond (96,000 square feet), benzene abatement system (50 feet × 50 feet), H_2S abatement system (60 feet × 60 feet) and one parking area (1,400 feet × 140 feet). Inside the fence surrounding the plant facilities is an access road for fire equipment and facility maintenance. All dimensions are approximate.

There will be eight new well pads (average size 5.2 acres), including 10 production wells on five pads and seven brine injection wells on three pads. Additionally, two existing pads located on the plant site will include two new injection wells: one of the two injection wells will be dedicated to injection of cooling tower blowdown and the other will be dedicated to injection of aerated brine when accumulated in the brine pond.

Wells will be directionally drilled and completed to minimize the well pad size.

3.3.2 Resource Production Facility

The fundamental purpose of the RPF is to extract geothermal brine, produce steam to power the turbine and re-inject the geothermal brine (See Figure 3.1-3). There are three different types of wells associated with the RPF. Production wells are used to extract geothermal fluids. Injection wells are used to inject geothermal brine after heat and steam have been extracted. The plant wells are two injection wells located on the northwest and northeast corners on the 80-acre plant site (see Figure 3.3-1A) that are dedicated for cooling tower blowdown and brine pond liquid injection. In addition to the wells, there are numerous processing components associated with the RPF. The RPF components are shown on Figure 3.1-3 and are described in the following subsections.

3.3.2.1 Production Wells and Pipelines

A total of 10 production wells on five new well pads will be required for full plant operation. The well pads will be located near the plant, with short aboveground production pipelines that run to the RPF, as shown in Figure 3.1-4. Wells are expected to be drilled to a depth of about 7,400 feet, with casing set at a depth of approximately 2,625 feet. Numerous factors were considered in selecting well locations, including efficient utilization of the geothermal resource, minimizing interference with existing production wells and environmental constraints. The proposed production wells are spatially separated from injection wells to optimize field development and reservoir management. Each well pad will be equipped with a production line warmup header. This will be used for starting up wells after they are drilled and during facility startup. During initial startup, the warmup header will feed into a warmup line, which will discharge into the production test unit located near the brine pond. Liquid from the production test unit will discharge into the brine pond.

Production brine will be piped through a $13^3/_8$-inch titanium or carbon steel string (wellbore piping), with a 16-inch wellhead piping and valves. Each well will produce an average of approximately 1,500 kph (1 kph = 1,000 pounds per hour) of a mixture of steam vapor, NCG, and brine in a two-phase flow. Expected properties of the produced fluid are as follows:

- 235,000 total dissolved solids (TDS)
- 0.3 percent NCG (at high pressure separation pressure)
- Total enthalpy: 400.9 Btu/lb
- Equivalent Reservoir Temperature: 535ºF

The chemical composition of the produced fluids is shown in Table 3.3-1.

Three aboveground production pipeline rights-of-way (ROWs) totaling approximately 1 mile long will connect the production wells to the plant site (see Figure 3.1-4). The pipelines would require a 100-foot ROW plus and additional 10 percent to accommodate several expansion joints required along the length of the pipelines. One or more pipelines would be constructed within each ROW (see Figure 3.1-4). The twin alloy pipelines from the wellhead each have isolation valves on both sides of an emergency shutoff valve. They each feed into a single pipeline header equipped with a header isolation valve. Each production well is instrumented with pressure and temperature sensors remotely monitored in the operator control room. Each well flows through the header isolation valve to a cement-lined carbon steel pipeline from the production island to one of two collection manifolds at the central brine handling facility. Each collection manifold will initially handle two-phase brine flow from at least five producers.

3.3.2.2 Brine/Steam Handling System

High-, standard-, and low-pressure steam are extracted from two-phase brine and sent to the steam turbine for power generation (see Section 3.3.3) in the systems described in the following subsections and illustrated on Figure 3.1-3.

3.3.2.2.1 High Pressure Separator System

The collection manifolds discharge the two-phase brine flow into four parallel wellhead separators. High-pressure (HP) steam is directed from each separator through alloy pipelines to HP scrubbers and HP demisters then into the HP inlets of the steam turbine. An overpressure venting system is included for system protection with vented fluids directed through an emergency relief tank to the brine pond. The HP flashed brine from each wellhead separator is collected in an alloy manifold and directed to the inlets of four parallel crystallizer systems.

3.3.2.2.2 Standard Pressure Crystallizer System

The four parallel crystallizer trains are sized to enhance the reliability of the RPF – one train can be taken out of service for maintenance while full power operation is maintained through the remaining trains.

Brine from each of the wellhead separators discharges into the respective trains' SP crystallizers. These vertical vessels are injected with silica-laden seed material to stabilize the brine and minimize the adhesion of silicate scale. Besides chemically stabilizing the brine, the SP crystallizer is also a separator that separates SP steam and brine for further processing. The SP steam is directed to scrubbers and demisters then into the SP inlets of the steam turbine. An overpressure venting system is included for system protection with vented fluids directed through an emergency relief tank to the brine pond. The seeded brine from the SP crystallizers discharges into the respective trains' LP crystallizer for further chemical stabilization and steam separation.

3.3.2.2.3 Low Pressure Crystallizer System

Brine entering the LP crystallizer is injected with dilution water produced by the dilution water heater to prevent salt precipitation in the downstream systems. The LP crystallizer operates in much the same way as the SP crystallizer in that it chemically stabilizes the brine and separates the steam and brine for further processing, although at a lower pressure and temperature than the SP crystallizers. The LP steam passes through a scrubber and a demister before entry into the steam inlets of the turbine. An overpressure venting system is included for system protection with vented fluids directed through an emergency relief tank to the brine pond. The LP brine is directed to an atmospheric flash tank that operates near atmospheric pressure.

3.3.2.2.4 Atmospheric Flash System

The atmospheric flash system lowers the brine pressure from the LP crystallizer to near atmospheric pressure conditions. Brine from the LP crystallizers discharge into the respective trains' Atmospheric Flash Tanks (AFT). Brine from these flash tanks flow by gravity to the brine clarification system. The AFT steam from each of the four trains is directed to one of two dilution water heaters. In these vessels, the atmospheric steam contacts turbine hotwell condensate or IID canal water to produce heated deaerated dilution water for injection into the LP crystallizer as described above.

3.3.2.2.5 Primary and Secondary Clarifiers

The heat-depleted brine is directed to the brine clarification system for brine polishing (the final stage of chemical stabilization followed by suspended solids removal) prior to injection. The brine clarification system consists of two parallel trains of primary and secondary clarifiers. The parallel trains provide an added measure of system reliability, and allow the plant to remain online while one train is taken out of service for maintenance.

Brine from the AFTs flow first to the primary clarifier in one of the two clarifier trains. Flocculation occurs in the primary clarifiers to enhance the brine polishing process. From the primary clarifier, the brine flows to the clarifier train's secondary clarifier. The secondary clarifier further polishes the brine for injection back into the brine reservoir in a condition that will not cause significant damage to the injection wells. The solids generated in the clarification system are directed to the vacuum filter press system for solids dewatering. Both the primary clarifiers and the secondary clarifiers are capped with steam to prevent oxygen intrusion, and each has alloy components to minimize corrosion. The primary and secondary clarifiers will each be equipped with overflow pipes, which discharge to the brine pond.

3.3.2.3 Solids Dewatering

A dilute slurry from the underflow of the clarification system is directed to one of two vacuum filter presses for solids dewatering. Silica-based materials are separated from the slurry in a continuous belt filtration process. The filter cake is loaded by one of two covered conveyor belts directly into end-dump trailers. After loading, these trailers are covered to minimize fugitive dust emissions. These trailers are stored for up to five days while an analysis of the solids is performed to confirm the regulatory classification as a nonhazardous waste. If the filter cake is determined to be a hazardous waste, the solids are transferred to a Class I regulated landfill. Nonhazardous filter cake will be transferred to a Class II regulated landfill for disposal.

The filtered effluent is directed to one of two thickeners. The thickener is designed to recover solids not captured in the filtration system. Slurry from the thickener is directed back to the inlet of the filtration system for dewatering. Liquid from the thickener is directed to an injection well.

3.3.2.4 Brine Injection System

The polished brine from the secondary clarifier is pumped from the RPF to the remote injection well pads via aboveground pipelines. Four booster and four main injection pumps (each at 67 percent total brine flow capacity, two pump sets for each clarifier train) deliver the heat-depleted brine to the injectors through cement-lined carbon steel injection lines. Each injector is remotely metered for pressure, temperature, and flow rate.

3.3.2.4.1 Pumping Station

The pumping station will be equipped with two sets of 67 percent pump trains for each clarifier train. Each pump train will consist of a booster pump and a main injection pump. The pumps will be designed for the required pressure once the post-drilling testing is complete. The pumping station will include a local control panel. The main control for this pumping station will be included both within a motor control center and within the main control room for the SSU6 Project.

3.3.2.4.2 Injection Wells

A total of seven injection wells will be located on three new injection well pads. The injection well pads will be located southeast of the RPF, as shown in Figure 3.1-4. Wells are expected to be drilled to reach depths of between 8,500 feet and 8,800 feet. Injection wells will be cased to a depth where static subsurface temperatures are above 480 °F and where rocks are stable. The injection wells are planned as low-angle slant or “S”-shaped wells to minimize displacement from the wellhead and be able to intercept fractures of multiple orientations.

As indicated in Section 3.4.2, these seven injection wells will be dedicated to the injection of secondary clarifier effluent. One additional injection well is dedicated to the cooling tower blowdown, and one additional injection well to the brine pond liquids. These two plant wells will be located on the plant site. The amount and characteristics of these streams are summarized in Table 3.3-2.

3.3.2.4.3 Injection Pipelines

Three aboveground injection pipeline ROWs totaling approximately 3 miles long will connect the plant site to the injection wells (see Figure 3.1-4). The pipelines would require a 100-foot ROW plus an additional 10 percent to accommodate several expansion joints required along the length of the pipelines. One or more pipelines would be constructed within each ROW (see Figure 3.1-4). The aboveground injection distribution pipelines will be constructed of cement-lined carbon steel. The pipes are installed on supports and are elevated 3 feet above grade.

3.3.2.4.4 Brine Pond

Figure 3.3-7 depicts the plan, section, and detail of both brine ponds within the plant facility. The brine ponds are large cement-lined basins that are sized to accommodate up to four hours of brine released under upset conditions, plus 2 feet of freeboard. During such upset conditions, brine that overflows from the clarifiers and the thickener, and condensate from the steam vent tanks would be directed to these ponds for temporary containment, after which this liquid is pumped to the aerated brine injection well located at the facility. Reject water from the reverse osmosis system will also be directed to the brine pond.

The brine pond would also collect brine from the production wells when they are flow-tested after drilling and from the production wells when brine is initially introduced into the facility during startup. This liquid would be discharged into an injection well after startup is complete. Monitoring wells are adjacent to the brine pond to comply with regional ground water regulations.

3.3.3 Power Generation Facility

3.3.3.1 Turbine Generator System

The turbine generator system will consist of a condensing turbine generator set with three steam entry pressures (HP, SP, and LP). The 3,600-revolutions-per-minute (RPM) turbine generator is a multi-casing, triple-pressure, exhaust flow condensing turbine. It will be nominally rated at 200 MW. Nominal turbine inlet pressures are as follows:

- High pressure: 300 pounds per square inch gauge (psig)
- Standard pressure: 120 psig
- Low pressure: 20 psig

The turbine is directly coupled to a totally enclosed water and air-cooled (TEWAC) synchronous-type generator. The generator is expected to have a design rating of 235 megavolt amperes (MVA) at a power factor of 0.85 lagging. The turbine-generator unit will be fully equipped with all the necessary auxiliary systems for turbine control and speed protection, lubricating oil, gland sealing, generator excitation, and cooling.

3.3.3.2 Heat Rejection System

The power cycle heat rejection system (see Figure 3.1-3) includes a 316 L stainless steel shell-and-tube type condenser, biological oxidizers, a pair of counterflow cooling towers, an NCG removal system, H_2S abatement system and activated carbon adsorbers. Steam from the turbines is condensed in the shell-and-tube type condenser. Fiberglass-reinforced plastic piping will transfer liquid condensate to the biological oxidizer unit located in one cell of each cooling tower, where hydrogen sulfide is removed. Gases that accumulate in the condenser will be evacuated by the NCG removal system to ensure maximum power generation efficiency. The NCG consists of four parallel trains, each designed for 33 percent of the maximum design NCG loading, thereby providing one train for standby service as needed. Each train will incorporate three stages, two ejectors, and one liquid ring vacuum pump. Auxiliary steam for the ejectors will be supplied from the standard pressure steam header. NCG from the vacuum pumps will be pressurized to approximately 2 psig and will then be vented to the H_2S abatement system.

3.3.3.2.1 H_2S Abatement System and Carbon Adsorbers

The H2S abatement system will be based on iron chelate technology (LO-CAT system as described under 3.3.4.7.1) used in the geothermal industry. This is a three-step process. First, the NCG entering the system is mixed with an iron catalyst solution in eductors. The NCG and solution exhaust into a vessel, where the treated NCG and solution are separated. The treated NCG, primarily CO2, is then routed to blowers and a series of carbon adsorbers for the control of benzene and other organics. In the second step, the catalyst solution is discharged to a settling vessel and is regenerated using compressed air. The catalyst is then re-cycled back to the eductors. Sulfur particles in the solution are collected by settling. In the third step, the sulfur that has settled is pumped to a vacuum belt filter system and is removed as a solid in end-dump trailers. As the reduction of H2S to sulfur is an exothermic reaction, the system will include a cooling system to remove the generated heat. Downstream from the LO-CAT System, the air stream is pumped to a series of carbon adsorbers for the control of benzene and other organics.

Further details regarding the operation of the SSU6 Project emission control systems are provided in Section 3.3.4.7.

3.3.3.2.2 Cooling Towers

Liquid from the condenser will be directed to a biological oxidizer that will be located in one cell of each tower. The biological oxidizer uses microorganisms to convert the hydrogen sulfide in solution to sulfate in the condensate. Oxidizers have been installed at other existing Salton Sea geothermal facility cooling towers. In practice, these oxidizers have reduced hydrogen sulfide concentration levels down to nondetectable levels in the cooling tower exhaust. After treatment in the oxidizer, treated condensate will then flow into the cooling tower basins to be used to offset water lost in evaporation or a storage tank to be used in the solids dewatering system. Second, condensate will be routed to a condensate storage tank and will then be used for other plant water demands such as the dilution water system, steam scrubbing water, and pump seal flush water. Any excess condensate not required for plant use will be routed to the excess condensate injection well located in the plant.

Each cooling tower will have 10 cells, equipped with 480V fans. Each fan will be partitioned, and circulation water will be able to be secured to each cell for maintenance purposes during normal operation. Each of the two cooling towers will be equipped with three 50 percent capacity, vertical, wet-pit circulating water pumps (one in operation and one in standby) designed to circulate water between the cooling tower and the turbine condensers. Each cooling tower will also be equipped with one 100 percent-capacity, vertical, wet-pit auxiliary water pump designed to move water between the cooling tower and the plant auxiliary cooling loads. The plant auxiliary cooling water loads will include the NCG removal system, turbine oil cooling system, solids dewatering system, and H_2S abatement system.

3.3.4 Facility Support Systems

3.3.4.1 Major Electrical Equipment

3.3.4.1.1 AC Power Transmission

The one-line drawing of the proposed electrical generation and distribution system is shown in Figure 3.3-8. Power will be produced at the facility by the 16 kV TEWAC generator. The output of the steam turbine generator is connected by isolated phase bus to a two-winding, oil-filled (16 to 161 kV) STG main step-up transformer. Surge arrestors around the high-voltage bushings protect the transformer in the 161 kV system from lightning strikes or other disturbances. The transformer is set on a concrete pad with an oil containment system. A fire protection system is provided. The high voltage side of the main step-up transformer is connected to a 161 kV switchyard using 230 kV-rated high-voltage circuit breakers with associated disconnect switches.

3.3.4.1.2 AC Power Distribution

Plant power will be provided from the switchyard through the STG main step-up transformer and unit auxiliary transformers. Two auxiliary transformers will be rated to supply plant startup and normal operating power requirements. Each transformer will be sized for half the installed station auxiliary loads. The unit auxiliary transformers will be connected by an insulated cable from the main isolated phase bus. Each unit auxiliary transformer will be provided with a neutral ground resister to limit ground fault current. Ground fault relaying will be provided on the 4,160-volt secondary neutral.

The 4,160-volt switchgear will provide power to the load center (LC) transformers and the 4,160-volt emergency bus. Medium voltage motors (250 horsepower and above) will be supplied from the 4,160 volt system using motor controllers.

The load center transformers (4,160-480V, 3-phase, 60 hertz, outdoor, oil-filled) will provide power to the 480 volt Motor Control Centers (MCCs). The MCCs distribute power to all 480 volt motors (up to 200 horsepower), 480 volt power panels, and to other 480 volt loads. The neutral of the 480-volt system is grounded with individual feeder ground fault detection.

The 480-volt MCCs and/or 480-volt power panels provide power to 480-120/208 volt dry-type power and lighting transformers.

3.3.4.1.3 Startup Power

The plant is not black-start capable. Electric power from the utility system must be present to be able to bring the facility on-line. During normal startup, power required for auxiliaries will be provided from the utility (IID) through the STG main step-up transformer, then through the unit auxiliary transformers.

3.3.4.1.4 Emergency Power

In case of a total loss of auxiliary power, or in a situation when the utility system is out of service, the emergency power for critical loads (i.e., brine booster pumps; air compressor; turbine turning gear; emergency lighting; heating, ventilation, and air condition [HVAC]; and other vital loads) will be supplied by the standby emergency generators. A 2 MW, 4,160-volt generator and a 300 kW, 480-volt generator will be installed. These generators are sized to maintain operation of the RPF and critical loads associated with the PGF and common facilities.

3.3.4.1.5 DC Power Supply

The DC power supply system consists of two battery banks, each with a 125 VDC full-capacity battery charger, metering, ground detector, and distribution panel. One 125 VDC battery will be dedicated to the essential service (UPS) system. The other 125 VDC battery will feed all other station DC loads. The station 125 VDC system supplies control power to the generator circuit breakers, protection relay panels, 4,160 V switchgear, DC lube oil pump, and to other critical control circuits. Under normal operating conditions, the battery chargers supply DC power to the DC loads. The battery chargers receive 480 V, 3-phase AC power from one of the MCCs and continuously charge the batteries while supplying power to the DC loads. The 125 DC system is an ungrounded system, and a ground detector monitors grounds on the DC power supply system.

3.3.4.1.6 Essential Service AC (UPS)

The facility essential service 120 VAC, single-phase, 60 Hz power source will supply AC power to essential Distributed Control System loads and to unit protection and safety systems that require uninterruptible AC power. The essential service AC system and its DC power supply system are both designed to supply critical safety and unit protection control circuits. The essential service AC system consists of one full-capacity charger and inverter, one dedicated 125 VDC battery system, a solid-state transfer switch, a manual bypass switch, an alternate source transformer and voltage regulator, and AC panelboards.

When the normal 480 V source of power to the system fails, the dedicated 125 VDC battery powers the inverter to the panel boards. The solid-state transfer switch continuously monitors both the inverter output and the alternate AC source. The transfer switch automatically transfers essential AC loads without interruption from the inverter output to the alternate source upon loss of the inverter output. A manual bypass switch isolates the inverter-static transfer switch for testing and maintenance without interruption to the essential service AC loads. Recharging of a battery occurs when 480 V power returns from the AC power supply (480 V) system. The rate of charge depends on the characteristics of the battery, battery charger, and the connected DC load during charging; however, the maximum recharge time is 8 hours.

3.3.4.2 Water Supply and Treatment

The source of external freshwater for the facility will be the IID canal water. The delivery point for the IID canal water will be the Vail 4A Lateral, Gate 460 at the southeast corner of the proposed power plant site, along Boyle Road. Transfer to the service water pond will be via a proposed 500-foot-long buried 10-inch pipeline. The water is then used for dilution water and other process uses and the reverse osmosis (RO) potable water system.

3.3.4.2.1 Dilution Water and Other Process Uses

The single largest water demand for the facility is cooling tower makeup to offset water lost through evaporation. In this facility, this is provided by geothermal steam condensate. The proposed facility would also use water for dilution of geothermal brine, solids dewatering system, steam wash water, and purged water for pump seals. This facility is designed to minimize reliance on external sources of water supply for these process needs as well by using condensed steam from the geothermal steam condensate to the greatest extent practical. By doing this, it is expected that less than 5 percent of the process water needs on an annual average basis will have to be met from an external water supply.

Canal water will also serve as the source of water for maintenance purposes and fire water for the fire protection system, and it will be used to charge the cooling tower prior to startup.

3.3.4.2.2 Reverse Osmosis Potable Water System

A potable water system will be used to supply drinking water, wash basin water, eyewash equipment water, water for showers and toilets in crew change quarters, and sink water in the sample laboratory. Drinking water will be produced by the canal water RO system with treatment.

3.3.4.2.3 Water Supply Requirements

The SSU6 requires an average of 293 acre-feet per year (afy) of water when operating at full plant load for uses primarily including reverse osmosis and dilution. The expected daily and annual water use for the SSU6 Project are shown in Tables 3.3-3 and 3.3-4. Average annual supply requirements will vary, depending on the capacity factor of the overall facility.

3.3.4.2.4 Water Balance

Figures 3.3-9 and 3.3-10A through E show the water balance and the heat/mass balance, respectively, for summer design conditions.

Over 95 percent of the water required by the facility will be generated by steam condensed from the brine. On an annual average basis, water needs from the IID canal are approximately 293 afy at design conditions, which is less than 5 percent of the total facility water needs.

3.3.4.2.5 Water Quality

The expected concentration of constituents in the IID canal water supply is listed on Table 3.3-5.

3.3.4.3 Liquid Process Wastes

Waste streams are included with other process streams in the Water Balance Diagram (Figure 3.3-9). The flow rates shown are based on summer ambient conditions with operations at 100 percent load. The primary discharge will consist of spent brine from the secondary clarifiers that is injected directly into the injection wells to replenish the geothermal resource. Process brine waste characteristics are summarized in Table 3.3-2. Under overflow conditions, this brine would be directed to the brine pond, after which it would be injected into a separate dedicated injection well. This dedicated injection well would also receive liquid from the thickener, which collects filter press filtrate, and liquid from the bermed areas around the plant equipment. The brine pond also receives liquid from the emergency relief tanks and rejects water from the RO system. Monitoring wells would be provided adjacent to the brine pond to comply with RWQCB ground water regulations. Brine injection will take place in accordance with California Department of Oil and Gas regulations.

A secondary source of wastewater is blowdown from the cooling towers. This wastewater will be injected into one of the two dedicated injection wells.

The sanitary drains will discharge to a septic tank. Waste from the septic tank will be pumped out regularly. Rain and storm drainage will be collected in the drainage water detention pond on the northwest corner of the facility location. The drainage pond is designed for 3 inches of precipitation in a 24-hour period (100-year storm conditions). Water accumulation will be injected into one of the two dedicated plant injection wells.

3.3.4.4 Non-Hazardous Waste Management

The construction and operation of the facility will generate non-hazardous and hazardous wastes. The hazardous materials and wastes expected to be used or generated by the facility are described below. The largest waste stream will be filter press cake with approximately 120 tons per day to be generated during operations (see Table 3.3-6 for chemical composition). The construction of the facility will generate various types of nonhazardous solid wastes, including debris and other materials requiring removal during site grading and excavation, excess concrete, lumber, scrap metal, and empty nonhazardous chemical containers.

3.3.4.4.1 Solid Waste-Construction

Inert solid waste from construction activities may include lumber, excess concrete, metal, and glass scrap, and empty nonhazardous containers. Management of these wastes will be the responsibility of the construction contractor(s). Typical management practices required for non-hazardous waste management include recycling when possible, proper storage of waste and debris to prevent wind dispersion, and weekly pickup and disposal of wastes to local Class III landfills. The total amount of solid waste to be generated by construction activities has been estimated to be similar to that generated for normal commercial construction. Table 3.3-7 provides an overview of the waste streams anticipated to be generated during the construction phase of the project.

3.3.4.4.2 Solid Waste-Operations

The operating waste streams and management methods are summarized in Table 3.3-8. Facility maintenance will include removal of scale from the walls of piping and brine handling equipment, and the removal of sludge from the primary and secondary clarifiers, and brine ponds. All nonhazardous wastes will be recycled to the extent practical and the remainder removed regularly by a certified waste handling contractor.

The primary source of solid waste will be the precipitated solids from the geothermal resource fluid. After the steam separators, the geothermal resource fluid will be treated through clarifiers where some of the silica, iron, and manganese contained in the brine will be removed. Following this separation process, the solids slurry discharging from the bottom of the clarifiers will be directed to a vacuum filtration system. The slurry feed from the clarifiers to the filtration system will be acidified to prevent heavy metal precipitation in the filtration system. Approximately 120 tons per day of solids would be removed from the filter press system. Based on the proposed design of the facility, it is likely that over the life of the project, the SSU6 can achieve a goal of generating 95 percent of the filter press cake that will be characterized as non-hazardous. Five percent will likely be characterized as hazardous because of elevated concentrations of heavy metals. Liquids from the filtration system will be routed to a thickener system for additional solids removal. Slurry discharged from the thickener will be discharged to the filtration system. Liquid from the thickener system will be routed to the aerated brine injection well.

The composition of the solids is summarized in Table 3.3-6. The filter cake will be disposed of at a suitable offsite landfill in accordance with applicable regulations (see Section 3.3.2.3).

The activated carbon from the benzene abatement system described in Section 3.3.5.1 will be regenerated on site by means of process steam and will be occasionally shipped back to the manufacturer for reactivation.

Office waste and general refuse will be removed by the local sanitation service.

An estimated 2.5 tons per day of sulfur will be generated by the LO-CAT H_2S abatement system described in Section 3.3.4.7. This sulfur will be trucked to an appropriate offsite landfill in accordance with applicable regulations.

3.3.4.5 Hazardous Waste Management

Small quantities of hazardous wastes will be generated over the course of construction (see Table 3.3-7). These may include waste paint, spent solvents, and spent welding materials. All hazardous wastes generated during facility construction and operation will be handled and disposed of in accordance with applicable laws, ordinances, regulations, and standards. Any hazardous wastes generated during construction will be collected in hazardous waste accumulation containers near the point of generation and moved daily to the contractor's 90-day hazardous waste storage area located on site. The accumulated waste will subsequently be delivered to an authorized waste management facility. Hazardous wastes will be either recycled or disposed of in a licensed Class I disposal facility as appropriate. Managed and disposed of properly, these wastes will not cause significant environmental or health and safety impacts.

Hazardous wastes expected from operations are shown in Table 3.3-8. Some hazardous wastes will be recycled, including spent activated carbon from the benzene abatement system, used oils from equipment maintenance, and oil-contaminated materials such as spent oil filters, rags, or other cleanup materials. Eventually, spent activated carbon will be returned to the manufacturer for regeneration and/or sent to an appropriate disposal facility. Used oil will be recycled, and oil or heavy metal contaminated materials (e.g., filters) requiring disposal will be disposed of in a Class I waste disposal facility. Scale from pipe and equipment cleaning operations, and solids from the brine pond, will be disposed of in a similar manner.

The plant will generate hazardous solid waste from maintenance. The source of these solid wastes will be solid deposits in the clarifiers and other equipment and piping. These solid wastes will be disposed of at an appropriate landfill. The amount of waste produced is anticipated to be approximately 150,000 cubic feet every two to three years.

3.3.4.6 Hazardous Materials Management

Prior to operation, the SSU6 Project will develop and implement a Hazardous Materials Business Plan (HMBP), which will include, at a minimum, procedures for:

- Hazardous materials handling, use, and storage
- Emergency response
- Spill control and prevention

- Employee training
- Reporting and record keeping.

A variety of chemicals will be stored and used during construction of the facility. Hazardous materials to be used during construction include unleaded gasoline, diesel fuel, oil, lubricants (i.e., motor oil, transmission fluid, and hydraulic fluid), solvents, adhesives, and paint materials. There are no feasible alternatives to these materials for construction or operation of construction vehicles and equipment, or for painting and caulking buildings and equipment.

In general, construction contractors will use lubricating oils, solvents, and other hazardous materials during construction of SSU6. The contractor will be responsible for assuring that the use, storage and handling of these materials will comply with applicable federal, state, and local LORS, including licensing, personnel training, accumulation limits, reporting requirements, and recordkeeping. An HMBP will be developed to outline hazardous materials handling, storage spill response, and reporting procedures.

Chemicals anticipated to be used during operation are provided in Table 3.3-9. The storage, containment, handling, and use of these chemicals will be managed in accordance with applicable laws, ordinances, regulations, and standards.

Chemicals will be stored in chemical storage facilities appropriately designed for their individual characteristics. Bulk chemicals will be stored outdoors on impervious surfaces in aboveground storage tanks with secondary containment. Secondary containment areas for bulk storage tanks will be covered and will not have drains. Any chemical spills in these areas will be removed with portable equipment and reused or disposed of properly. Other chemicals will be stored and used in their delivery containers. A portable storage trailer may be on site for storage of maintenance lube oils, chemicals, paints, and other construction materials, as needed. Drains from chemical storage and feed areas that use portable vessels will be directed to the brine pond and discharged together with other plant wastewater to the dedicated injection well. All drains and vent piping for volatile chemicals will be trapped and isolated from other drains to eliminate noxious vapors.

Safety showers and eyewash stations will be provided in or adjacent to chemical storage and use areas. Safety equipment will be provided for personnel use if required during chemical containment and cleanup activities. All personnel working with chemicals will be trained in proper handling and emergency response to chemical spills or accidental releases. Hose connections will be provided near chemical storage and feed areas to flush spills and leaks, and absorbent materials will be stored on site for spill cleanup.

3.3.4.7 Emissions Control Equipment

The proposed geothermal facility does not use combustion to generate electricity. Therefore, there are only minimal emissions of criteria pollutants, such as NOx, CO, SO_2, and VOCs. The Applicant proposes to use best available control technology, management practices, and process monitoring equipment to minimize the air emissions from the proposed plant. The three pollutants that would have the potential of significant impacts to air quality if uncontrolled are PM_{10}, H_2S, and benzene. This section describes the emissions controls.

The following subsections describe the emissions controls for these pollutants. Additional information on these pollutants and their controls is included in Section 5.1.

3.3.4.7.1 Particulate Emissions

The primary source of particulate emissions from the SSU6 Project is the proposed dilution water heaters and the cooling towers. During normal operating condition, the plant is predicted to generate less than 3.8 lb/hr of particulates. Particulate emissions from the cooling towers will be minimized by maintaining the TDS concentration in the circulating water and by controlling cooling tower drift losses to not more than 0.0006 percent of the total circulation rate. Particulate emissions from the dilution water heater will be minimized by design and operation of this vessel to reduce carryover. Particulate emissions from the filter cake handling equipment will be controlled by minimizing handling and keeping the filter cakes covered.

3.3.4.7.2 H_2S Emissions

The SSU6 Project will not result in a net increase in H_2S emissions during normal operations. This will be accomplished using the LO-CAT system for control of H_2S emissions in the noncondensible gas stream. This proven technology is currently in use in other geothermal facilities. In addition to the utilization of this control technology, the Applicant will make verifiable quantifiable and enforceable reductions in H_2S emissions at one of its existing facilities. These reductions will serve to offset the lower H_2S emissions produced from the SSU6 Project through the utilization of the LO-CAT system.

The LO-CAT System operates as follows: The noncondensible gas stream is mixed in a catalyst solution in a co-current venturi contactor, where the H_2S is absorbed and reacts with an iron catalyst to form sulfur particles. The gas and solution then enter a horizontal separator vessel. Four venturis operate in series for this system, effectively abating the H_2S in the process. All four venturis are on the same separator vessel. The treated gas then enters a knockout vessel section, also on the horizontal separator, and passes through a mist eliminator. The solution from the venturis collects in the separator vessel and is pumped to the LO-CAT oxidizer for catalyst regeneration.

The LO-CAT oxidizer has three functions:

1. Regeneration of the iron catalyst using compressed air. The vessel is fitted with a sparger system that permits uniform air addition over the entire vessel crosssection. The sparger is designed to cause a reduction in solution specific gravity, which creates an “air lift” and promotes circulation of the LO-CAT solution in the oxidizer vessel. The internal recirculation rate and catalyst regeneration are maintained by the addition of air through the oxidizer spargers. A standby oxidizer blower is provided to prevent shutdown if one of the blowers fails.
2. Solution cooling/heating. The reduction of H_2S to elemental sulfur is an exothermic reaction. If the heat of reaction is not removed from the system, the catalyst solution temperature will rise above the design temperature. At relatively low sulfur production rates, the heat removed from the system by ambient heat loss and the latent heat required for the evaporation water in the oxidizer, are greater than the heat of reaction. When relatively large amounts of sulfur are produced, the heat of reaction exceeds the heat loss and latent heat requirements, and heat must be removed from the system via a cooler.

3. Sulfur settling. Sulfur particles enter a settling cone with the LO-CAT catalyst solution and settle to the bottom, producing 5 to 15 weight percent slurry. The slurry is pumped to the belt filter by a progressive cavity pump. The cone is equipped with air blast spargers, which inject blasts of air around the circumference of the cone on a timed cycle to prevent plugging.

Slurry from the settler is pumped to the vacuum belt filter for sulfur separation. The sulfur cake discharges to a Dumpster through a chute. Filtrate from the belt filter is recycled back to the oxidizer by a filtrate pump after splitting off a blow-down stream. (The blowdown stream — manually controlled by a rotameter and adjusted dependent on the rate of production of soluble salts — is required to prevent precipitation of the dissolved salts from the LO-CAT solution.) Coverage is provided to prevent contamination from external sources, and to help contain the sulfur that is produced until it is transported from the facility.

Five additives are required continuously:

1. ARI-340 Catalyst
2. ARI-350 Chelate-rich make-up
3. ARI-400 Biocide
4. ARI-600 Surfactant
5. 50 wt% NaOH or 45 wt% KOH.

Each reagent drum or tank is equipped with a level gage to calibrate chemical injection rates. Antifoam is sometimes required to suppress foaming. Although most of the H_2S in the steam is extracted with the NCGs and abated as described above, some of it remains in the condensate. Prior to entering the cooling tower, H_2S in the condensate is oxidized via a condensate oxidizer, which abates residual H_2S in the condensate. The outer shell of this oxidizer is a box made of 0.75-inch plywood. The bottom of the filter is open to atmosphere while the rest is water tight with a bead of sealer between all columns and edges of plywood. Textured polyurethane sheets are installed in the oxidizer. This fill material is used as a substrate for microorganisms.

Removal of H_2S from the condensate is achieved by bio-filtration. Microorganisms are sustained in the oxidizer by the H_2S as well as phosphate (phosphate in some cases is added to the condensate). These microorganisms are supported by the fill material inside the oxidizer. Condensate is evenly distributed over the fill by the PVC piping network. The residual H_2S, as it passes through the filter, makes contact with the microorganisms and is consumed. This “bio-filtered” condensate then falls directly into the cooling tower basin. Additional equipment may be required to achieve optimal operating conditions, including a phosphate injection system that injects diluted phosphate into the condensate upstream of the oxidizer to promote the growth of microorganisms, and a wet down system that adds moisture periodically to the oxidizer to promote growth of the microorganisms that must have a moist environment in which to live.

3.3.4.7.3 Benzene Emissions

The NCG stream may also produce relatively low rates of benzene (approximately 3.5 lb/hr). To reduce this emission, the plant will be equipped with a benzene abatement system. The NCG stream will be passed through an activated carbon bed before being dispersed in the cooling tower. Pilot testing has shown that activated carbon will absorb 95 percent of the benzene in an NCG stream containing 40 to 70 ppm of benzene. The activated carbon beds will be arranged to allow continuous abatement and continuous plant operation while the spent beds are regenerated at site by using process steam. Carbon adsorbant will generally be regenerated on site. A discharge stream from activated carbon regeneration will be returned to the geothermal resource via the condensate injection well, which is one of the two plant wells on the plant site. Occasionally, spent carbon beds may be returned to the manufacturer for reactivation.

3.3.4.7.4 Steam Vent Emissions – Turbine Bypass

The turbine bypass provides the ability to divert high-pressure steam, which contains almost all of the H_2S produced by the geothermal resource (greater than 90 percent), from the turbine inlet directly into the condenser to reduce H_2S emissions below an acceptable level in the event of a plant trip during operations. Standard- and low-pressure steam will be diverted to two steam vent tanks and released to the atmosphere.

The proposed bypass will be equipped with a motor-actuated isolation valve closed during normal operation. Condensed steam from the turbine condenser will be routed through the hotwell pumps to the plant condensate distribution system utilized during normal operations. As steam condenses, non-condensable gases will continue to be routed to the existing LO-CAT and benzene systems for H_2S and benzene abatement.

Because maintaining vacuum is preferred in the main condenser during turbine bypass operation to limit stress on the plant systems, non-condensable gases are routed to the LO-CAT system through the vacuum pumps, air ejectors and intercondensers utilized during normal operations. However, in the event that standby electrical power availability is limited, a bypass around the vacuum pump will be installed. In this mode of operation, condenser pressure will increase to 2 psig, providing sufficient pressure to move the non-condensable gas through the air ejectors, intercondensers and to the abatement plant. Motive steam to the air ejectors will be secured in this configuration. Auxiliary cooling pumps, intercondensers, a condensate pump, two circulating water pumps and cooling tower fans will remain in service to condense the steam and cool the non-condensable gases below 130 deg. F, suitable for processing in the LO-CAT and benzene abatement systems.

Installation of the turbine bypass system will provide the facility the ability to lower emissions of H_2S during upset conditions. The operation of the system is dependent on the availability of electrical power and the operation of certain plant equipment. Depending on the particular circumstances triggering an upset condition, a total loss of power or equipment failure may prevent operation of the turbine bypass. To provide a safe method of relieving the high-pressure steam during these upset conditions, the plant will be equipped with two high-pressure atmospheric flash tanks. Temporary emissions may occur for a short period of time at the high-pressure steam vents until the turbine bypass system could be placed in service or until steam generation could be secured.

A simplified process flow diagram is presented in Figure 3.3-15.

3.3.4.8 Fire Protection and Safety Systems

The plant fire protection and safety systems are designed to limit personnel injury, property loss, and plant downtime caused by a fire or other event. The systems are designed in accordance with:

- Federal, state, and local fire codes, occupational health and safety regulations, and other jurisdictional requirements
- California Building Code (CBC)
- National Fire Protection Association (NFPA) standard practices.

The fire protection system will consist of an underground fire main and surface distribution equipment meeting NFPA codes such as yard hydrants and hose houses, monitors around the perimeter of the cooling tower, automatic sprinklers for the turbine generator and auxiliary equipment, automatic spray system for the main step-up transformer, and a complete fire detection and alarm system. The firewater supply and pumping system will provide an adequate quantity of fire-fighting water.

An underground 10-inch-perimeter firewater loop, in accordance to NFPA 24 standards, will supply water to the cooling tower area, crystallizer/clarifier area, and the turbine generator area. Buried and subsurface carbon steel pipe will be wrapped and coated externally for corrosion resistance. Non-metallic pipe is permitted, but design considerations must take into account surface loads on the aboveground area and settlement potential of the pipe. Several hydrants with hose stations, strategically located around the plant perimeter, are connected to this header. Hydrant locations will permit full coverage of the protected areas with 75-foot-long hoses. Threaded connections will conform to local standards, and monitor stations will be installed around the cooling tower that provide complete coverage of the cooling tower.

Post indicator valves (PIV) would be located at various points along the loop to permit shutdown of one section of the loop without decommissioning the entire loop. An automatic wetdown system for the cooling tower would also operate when the plant is down. This system wets the tower structure periodically to keep the wood moist. Wetdown system requirements would be met by the tower wetdown pumps. The turbine generator lube oil system, including the turbine and generator bearings, will be protected with an automatic sprinklers and/or water spray systems in accordance with NFPA 13 and NFPA 15. The main step-up transformer will be protected with an automatic water spray system in accordance with NFPA 15. Electrical equipment buildings will be monitored with a smoke detection system.

A fire protection control panel will be provided and installed in the control room. The fire protection control panel will monitor and alarm the complete fire protection system. The fire detection and monitoring systems will be designed and installed in accordance with NFPA 72D and 72E. The fire protection system would have three pumps: a 2,500-gpm motor-driven fire pump; a 2,500-gpm diesel engine driven fire pump; and a 25-gpm jockey pump. These units will be mounted on one skid. They will be enclosed by a piece house with accessories, all conforming to NFPA 20. The house will include sprinkler system, louvers, space heaters, lights, exhaust fans, electrical distribution panel, and will conform to all local and state building codes. There will also be a firewater tank with a storage capacity of 300,000 gallons. The tank will include a standpipe section, which will ensure a minimum supply of water for fire protection.

In addition to the fixed fire protection system, portable carbon dioxide (CO_2) and dry chemical extinguishers will be located throughout the plant (including the switchgear rooms), with size, rating, and spacing in accordance with NFPA 10. Handcart CO_2 extinguishers will also be provided in the turbine area as necessary for specific hazards.

Local building fire alarms will be provided in accordance with NFPA 72. All materials will be free of asbestos and will meet the fire and smoke rating requirements of NFPA 255.

3.3.4.9 Plant Auxiliaries

3.3.4.9.1 Lighting

Lighting on the project site will be limited to areas required for safety, will be directed on site to avoid backscatter, and will be shielded from public view to the extent practical.

All lighting that is not required to be on during nighttime hours will be controlled with sensors or switches operated such that the lighting will be on only when needed.

Lighting will be provided in the following areas:

- Building interior, office, control, and maintenance areas
- Building exterior entrances
- Outdoor equipment platforms and walkways
- Transformer areas
- Power island perimeter roads
- Parking areas
- Plant entrance

Emergency lighting from DC battery packs will be provided in areas of normal personnel traffic to permit egress from the area in case of failure of the normal lighting system. In major control equipment areas and electrical distribution equipment areas, emergency lighting permits equipment operation to allow auxiliary power to be reestablished.

3.3.4.9.2 Grounding

The electrical system is susceptible to ground faults, lightning, and switching surges that result in unit ground potential rises. This constitutes a hazard to site personnel and electrical equipment. A grounding system provides an adequate path to permit the dissipation of ground fault currents and minimizes the ground potential rise. The station-grounding grid is designed with adequate capacity to dissipate heat from ground current under the most severe fault conditions in areas of high ground fault current concentration. The grid spacing is such that safe voltage gradients would be maintained. Bare conductors would be installed below grade in a grid pattern. Each junction of the grid would be bonded together by either an exothermal welding process or mechanical connectors.

Ground resistivity readings performed as part of the subsurface investigations would be used to determine the necessary numbers of ground rods and grid spacing to ensure safe step and touch potentials under fault conditions. Grounding cables would be brought from the ground grid to connect to building steel and nonenergized metallic parts of electrical equipment. Isolated grounding conductors to the ground grid will be provided for sensitive control systems.

3.3.4.9.3 Cathodic Protection and Lightning Protection

Cathodic protection for buried carbon steel pipes and structures (except rebar) takes into account cathodic protection and grounding influences associated with any existing cathodic protection system to which the facility is adjacent and connected. Cathodic protection would be provided by an impressed current system, a sacrificial system, and/or protective coatings. Lightning protection would be furnished for buildings and structures in accordance with NFPA 78. Lightning protection for the switchyards would be in accordance with industry practice.

3.3.4.9.4 Distributed Control System

A distributed control and information system (DCS) would provide modulating control, digital control, and monitoring and indicating functions for operation of the proposed plant power island and offsite systems. Plant operation would be controlled from the cathode ray tube (CRT) type control consoles and the auxiliary control panels that would be located in the control room.

The DCS would provide coordinated control among the STG and balance-of-plant equipment. The STG control systems would interface with the DCS via a data link and/or hardwired input/output (I/O) devices. Limited monitoring and control will be available from the DCS for STGs. The balance-of-plant equipment will be monitored and controlled via the DCS. A sequence-of-events (SOE) function will be an integral part of the DCS. Indication of process changes that warrant action (e.g., process alarms, etc.), or information that the operator in the control room should be made aware of (annunciation) will primarily be done in the DCS. Major packaged subsystems (i.e., water treatment system, fire protection system, etc.) may have a local alarm system with a single trouble alarm to the control room.

3.3.4.10 Heating, Ventilation, and Air Conditioning

The HVAC system will provide an acceptable environment for personnel comfort and equipment operation within the plant buildings. The HVAC system will be designed in accordance with the Uniform Building Code (UBC) and the Uniform Mechanical Code (UMC) as prescribed by the California Code of Regulations. Air conditioning in the control and administrative areas will maintain a suitable environment for plant personnel. If required for proper equipment operation, humidity control will be provided in the control room. Outside air ventilation systems will be provided for buildings where air conditioning is not required. Normally occupied plant areas, including toilet areas, will be supplied with fresh air in accordance with the Uniform Building Code, ASHRAE Standard 62, and the California Code of Regulations.

3.3.4.11 Plumbing

The plumbing system will supply potable water to all fixtures and will collect and convey waste fluids to the waste collection system. Plant plumbing systems will be constructed in accordance with the Uniform Plumbing Code and local and state regulations. Potable water will be provided from IID canal water with treatment. Potable water will be provided to restrooms and kitchen facilities in the control building. Drinking water will be provided in the control building. Safety showers, eyewash stations, and utility hose bibs will be provided at appropriate locations throughout the facility.

Restrooms, sinks, water coolers, and floor drains will flow to the onsite septic tank.

3.3.5 Facility Civil/Structural Features

This section describes the buildings, structures and other civil/structural features that will constitute the facility as shown on Figure 3.3-1B (Plot Plan) and on Figure 3.3-11 (Rough Grading Plan). The entire site will be protected from flooding by a dike surrounding the site of suitable height to provide flood protection up to an elevation of at least 220 feet below sea level, in accordance with County flood control requirements. The dike will be 10 feet wide at the top, with a 42-foot base.

3.3.5.1 Power Generation Facility

The power generation facility will consist of the following major components:

- Condensing turbine with totally enclosed water and air-cooled synchronous-type generator and auxiliary systems (including lube oil skid).
- Noncondensible gas removal system.
- Heat rejection system consisting of condenser and two mechanical draft counterflow cooling towers.
- H_2S and benzene abatement systems.
- Control building and power distribution centers, including MCCs and switchgear.

The civil/structural features related to these major components are described below. Based on the geotechnical evaluation that was performed, most structures will likely require pile support as described below. Pile requirements may change when detailed foundation designs are conducted.

3.3.5.1.1 Steam Turbine Generator and Condenser

The steam turbine generator will be mounted on a raised concrete pedestal, which is supported by reinforced concrete mat foundation at grade. Concrete piles will support this mat foundation. The condenser will be located under the steam turbine and will be supported by the mat foundation. For operation and maintenance access, platforms are provided adjacent to the equipment. All equipment will have seismic anchoring that meets or exceeds requirements for CBC Seismic Zone 4.

3.3.5.1.2 Cooling Towers

The cooling towers will be supported and water contained by a reinforced concrete basin. Piles will support the basin mat if necessary (as determined by further geotechnical investigation and detailed foundation design).

3.3.5.1.3 Noncondensible Gas Removal System

The noncondensible gas removal system will be supported by a reinforced concrete mat foundation.

3.3.5.1.4 H_2S and Benzene Abatement Systems

The H2S and benzene abatement systems will be supported by reinforced concrete mat foundations.

3.3.5.1.5 Control Building and Power Distribution Center

The control building will be a single-story structure, the floor for which will be a reinforced concrete slab on grade. The control building will be approximately 40 feet by 120 feet by 16 feet tall. The control building houses the facility control room, offices, kitchenette, electrical room, and toilet facilities. The power distribution centers will be a pre-engineered, one-story-high metal building supported by several feet above grade and above the DCS field modules by reinforced concrete foundation concrete piers to provide cable access beneath the structures. The power distribution centers will house electrical switchgear, and motor control centers and will vary in size between 28 feet by 26 feet to 28 feet by 78 feet. The total square footage of the power distribution centers is 4,004 square feet. The control building and power distribution centers will be provided with heating, ventilation, and air conditioning equipment as required for equipment and personnel.

3.3.5.1.6 Lube Oil Skid

The lube oil skid will be supported on a reinforced concrete mat foundation.

3.3.5.1.7 Balance of Plant

Individual reinforced concrete foundations at grade will be used to support balance of plant (BOP) mechanical and electrical equipment. The BOP mechanical and electrical equipment includes common facilities and P6F equipment not listed above, but it is detailed in Appendix F, Sections F-3 and F-4.

3.3.5.2 Resource Production Facility

The resource production facility consists of the following major components:

- Offsite production and injection piping
- Wellhead separators
- Crystallizers
- Scrubbers and demisters
- Primary and secondary clarifiers
- Atmospheric flash tanks
- Emergency relief tanks
- Dilution water heaters
- Steam vent tanks
- Filter presses

- Brine ponds
- Service water pond
- Stormwater detention pond
- Yard tanks

3.3.5.2.1 Offsite Production and Injection Piping

Offsite production and injection piping will consist primarily of 24-inch or 30-inch concrete lined carbon steel piping and 16-inch well warmup piping. These will be supported on drilled pier cast-in-place foundations.

3.3.5.2.2 Wellhead Separators, Scrubbers, and Demisters

The wellhead separators, scrubbers, demisters, and filter presses will be supported on reinforced concrete mats at grade with piles.

3.3.5.2.3 Crystallizers, Atmospheric Flash Tanks, Emergency Relief Tanks, Steam Vent Tanks, and Dilution Water Heaters

The crystallizers, atmospheric flash tanks, emergency relief tanks, steam vent tanks, and dilution water heaters will each be supported by individual reinforced concrete or structural steel structures. These concrete structures will be supported on reinforced concrete mats with piles.

3.3.5.2.4 Primary and Secondary Clarifiers

The primary clarifier and secondary alloy will be lined carbon steel tanks of about 130 feet in diameter and approximately 20 feet high. Piles using either a mat base or ring wall base will support the clarifiers.

3.3.5.2.5 Filter Press

The filter press will be supported on a structural steel reinforced concrete mat.

3.3.5.2.6 Brine Ponds, Service Water Pond, Detention Pond

Two 800-foot by 90-foot brine ponds will be installed. The ponds will be designed in accordance with Title 27, Division 2 of the California Code of Regulations – Special Requirements for Surface Empondment. These ponds will be of earth construction and lined with an HDPE liner and concrete. Monitoring wells will be placed around the periphery of the ponds.

The service water pond (136,000 square feet) will be lined earthen structure that would hold only canal water for facility service water needs. The storm water detention pond (96,000 square feet) will also be an earthen structure.

3.3.5.3 Skids

The NCG skid will be supported by a reinforced concrete mat foundation. The lube oil skid will be supported on a reinforced concrete mat foundation.

3.3.5.4 Yard Tanks

The major yard tanks will include the following:

- Condensate storage tank (100,000-gallon capacity)
- Fire water tank (300,000-gallon capacity)
- Two thickener tanks
- Treated condensate storage tanks

The major yard tanks will be vertical, cylindrical, field-erected steel tanks supported on a suitable foundation consisting of either a reinforced concrete ring wall with an interior bearing layer of compacted sand for the tank bottom, or a reinforced concrete mat. Both of these may require piles. These tanks are protected from corrosion with internal and external coatings, as required.

All tanks will be securely anchored on a reinforced concrete foundation. Tanks, foundations, and piping connections will be designed to appropriate standards for the contents and seismic zone. Pilings and anchor bolts will be used, as required.

3.3.5.5 Roads

The facility will be served by the road network shown on Figure 3.1-2. An asphalt-paved access road will be constructed from McKendry Road. The control room parking lot and all in plant roads will also be asphalt paved.

3.3.5.6 Perimeter Berm/Floor Protection

The Imperial County General Plan indicates that the project site is in an area inside the 100-year floodplain. The site is within Federal Emergency Management Agency (FEMA) Zone A, which is considered an area within the 100-year floodplain and Zone D, which is considered an undetermined, but possible, flood hazard zone (FEMA, 1984). To protect the site from flooding, the entire 80-acre site would be enclosed by an 8-foot-high perimeter berm designed with 2H to 1V sloping sides. The berm on the north side of the plant site will be 24 feet wide at the top with a 42-foot base. The berm surrounding the rest of the plant will be 12 feet wide at the top, with a 42-foot base. This berm would protect the plant from flooding, and will be of adequate height to provide flood protection to an elevation of at least 220 feet below sea level in accordance with county flood control requirements. The plant site elevation is approximately 228 feet below sea level; consequently, the berm would be at least 8 feet high.

3.3.5.7 Site Grading and Drainage

The site is fairly level (see Figure 3.3-12). The proposed drainage design in general will flow from the southeast corner to the northwest corner toward the drainage detention pond in the northwest corner (see Figures 3.3-1A and 3.3-1B).

Within the actual project site, buildings and equipment are constructed on foundations with the overall site grading scheme designed to route surface water around and away from all equipment and buildings. The storm water drainage system is sized to accommodate 3 inches of precipitation in a 24-hour period (100-year storm event) and to comply with applicable local codes and standards. Buildings and equipment are constructed in a manner that provides protection from such a 100-year storm.

Storm water flows will be directed to the detention pond via ditches, swales, and culverts. Spill containment areas and sumps subject to spills of miscible chemicals would be drained to an enclosed oil/water separator. Oil from this oil/water separator would be collected in a waste oil tank for offsite recycling. Clean water from the oil/water separator would be discharged into the thickener.

Brine handling equipment will be contained in curbed concrete aprons, with drainage directed to the thickeners and subsequently to the aerated brine injection well.

3.3.5.7.1 Earthwork

Excavation work will consist of the removal, storage, and/or disposal of earth, sand, gravel, vegetation, organic matter, loose rock, boulders, and debris to the lines and grades necessary for construction. Materials suitable for backfill will be stored in stockpiles at designated locations using proper erosion protection methods. Excess materials will be removed from the site and disposed of at an acceptable location. Disposal of any contaminated material encountered during excavation will comply with applicable federal, state, and local regulations.

The existing site topography shown on Figure 3.3-12 will be graded to provide a level area for the facility at about elevation –228 feet. Where practical, topsoil will be segregated and stockpiled for reuse in areas that will be converted back to agriculture. Most soils in the project area are designated as Prime and Statewide Important soil types and will be reserved for reuse, as feasible. It is assumed that excavated materials will be suitable for backfill.

Approximately 105,000 cubic yards of cut and 167,000 cubic yards of fill will be required to achieve final grade as shown on Figure 3.3-11. It is estimated that approximately 62,000 cubic yards of fill will be imported to the site for earthwork, including the berm construction.

Graded areas will be smooth, compacted, free from irregular surface changes, and sloped to drain. Cut and fill slopes for permanent embankments will be designed to withstand horizontal ground accelerations for Seismic Zone 4. Slopes for embankments will be no steeper than 2:1 (horizontal:vertical). Areas to be backfilled will be prepared by removing unsuitable materials and rocks. The bottom of an excavation will be examined for loose or soft areas. Such areas will be excavated fully and backfilled with compacted fill.

Backfilling will be done in layers of uniform, specified thickness. Soil in each layer will be properly moistened to facilitate compaction to achieve the specified density. To verify compaction, representative field density and moisture-content tests will be performed during compaction. All testing will be in accordance with ASTM standards.

3.3.5.8 Sanitary Sewer Systems

Sanitary waste will be conveyed via an underground sewer system to a buried septic tank. Waste from this point will be periodically pumped out. The system will be constructed in conformance with the State of California and Imperial County regulations.

3.3.6 Electrical Interconnection

The IID will engineer, construct (or supervise and review the engineering and construction), own, operate, and maintain the transmission lines required for the facility starting at the facility's high-side switch of the generator step-up transformer. IID will operate the L-Line Interconnection between the proposed SSU6 switchyard and the existing L-Line. IID will also operate the IID Midway-Interconnection between the SSU6 switchyard to the existing Midway Substation (see Figure 3.1-2).

Two studies have been conducted by IID for the interconnection: the System Impact Study, and the Facilities Study (see Appendix P). The studies demonstrate the proposed interconnection meets the system requirements without causing lines to exceed their ratings.

3.3.6.1.1 Electrical Interconnection Points

The proposed 16-mile double-circuit L-Line Interconnection and the proposed 15-mile single-circuit IID Midway Interconnection would be a direct inter-tie between SSU6 and IID's existing L-Line and Midway substation.

3.3.6.1.2 Transmission Line Specifications

The transmission interconnections would be designed and constructed in accordance with "Rules for Overhead Line Construction" and other applicable state and local codes. General Order 95 (GO-95) describes a minimum conductor distance from the ground of 30 feet at 60 degrees Fahrenheit (°F), and 27 feet at maximum operating temperature. The proposed transmission conductor heights would be consistent with GO-95 .

The conductors would consist of two 3-phase Alternating Current circuits consisting of one or two 1-inch Aluminum Conductor Steel Reinforced (ACSR) conductors per phase. One shield wire with an integrated fiber optic cable will be installed on both the L-Line and IID Midway interconnections. The optical wire will be used for any necessary communications within IID's transmission.

Part of standard construction prior to wire installation involves measuring the resistance of the structure footings. If the resistance to the remote earth for each structure is greater than 25 ohms, additional ground rods are installed as necessary to lower the resistance below 25 ohms.

3.3.6.2 Routes

3.3.6.2.1 L-Line Interconnection

The proposed interconnection of the facility to IID's existing transmission system is a new 16-mile, double-circuit 161 kV line that would be constructed to connect the new substation to the existing L-Line, southwest of Highway 86 and Bannister Road (see Figure 3.1-2). The proposed L-Line Interconnection would run through approximately 2.8 miles of BLM land prior to connecting to the existing L-Line. The existing L-Line eventually connects to IID's existing El Centro and Avenue 58 substations. Figures 5.12-10a and 5.12-10b depict the existing conditions and a simulation of a portion of the proposed L-Line Interconnection from a residence along Lack Road, respectively.

The proposed double-circuit L-Line Interconnection would proceed south from the plant site along the east side of Severe Road, turning west along the south side of Kuns Road, then south along the east side of Crummer Road to Lindsey Road. The line would continue west along the south side of Lindsey Road to Lack Road, and then along the east side of Lack Road to Bannister Road. The line would be constructed on the south side of Bannister Road west to Highway 86 and across BLM managed land to the existing L-Line. The L-Line would be bisected and one of the double-circuit lines would be connected to the El Centro substation section and the other to the Avenue 58 substation section. The double-circuit L-Line Interconnection would have bundled 1033 ACSR conductor attached to 125-foot steel poles with 1,200-foot spans. Most of the transmission line would be strung across 1,200-foot spans, but to avoid obstacles along the ROW, the span could be as short as 800 feet. Most of the route would be located adjacent to existing roads and a 150-foot ROW would be required. There is no access road along the portion of the route through BLM lands, and a 300-foot ROW would be required.

3.3.6.2.2 IID Midway Interconnection

A 15-mile, single-circuit 161 kV IID Midway Interconnection would also be constructed from the new substation east to the existing IID Midway 230 kV substation. The 230 kV Midway substation would have a 161 kV line termination, a 161 kV breaker and a 161/230 kV transformer installed for the connection of the 161 kV line. The routes of both the L-Line and Midway Interconnection are presented on Figure 3.1-2.

The single-circuit IID Midway Interconnection would proceed south from the plant site toward Peterson Road, then east along Peterson Road, turning south along Boyle Road and connect to the east side of the road to Kuns Road. The route then turns east generally along the south side of Kuns Road except for a section from Gentry Road to Kruger Road where the line would cross to the north side. At Kalin Road, the line would turn north and run along the east side of Kalin Road to Hoober Road, where it would commence east generally along the north side of Hoober Road. The line would cross to the south side of the road in two sections: (1) between English Road and Highway 111, and (2) at the railroad to Carrick Road. The line would turn north to the Midway substation just east of center from section 32. The IID Midway Interconnection would have bundled 1033 ACSR conductor attached to 125-foot steel pole with 1,200-foot spans. Most of the transmission line would be strung across 1,200-foot spans, but to avoid obstacles along the ROW, the span could be as short as 800 feet. A 150-foot ROW is required for the entire length of this transmission line.

3.3.6.3 Substation Interconnect

The proposed L-Line Interconnection and IID Midway Interconnection would originate from the proposed IID Substation, south of the 80-acre plant facility. The proposed 161 kV IID Substation would consist of a double-bus, double-breaker system located on a 300-foot by 300-foot area directly south of the proposed plant site. Additional details are provided in Appendix P.

Existing facilities will be expanded at the existing Midway substation near Niland, California to accommodate the proposed IID Midway Interconnection from the plant facility. Additionally, rearrangement of the existing transmission line approach to the substation would be required to provide the necessary clearances between adjacent lines and other facilities. The 230 kV Midway substation would have a 161 kV line termination, a 161 kV breaker and a 161/230 kV transformer installed on the existing Midway substation for the connection of the 161 kV line.

3.3.6.4 Transmission Structures

Both transmission lines are three-phase Alternating Current circuits consisting of 1 or 2 ACSR conductors per phase supported by 230 kV insulators. The minimum conductor distance from the ground would be 35 feet, which is consistent with GO-95 standards of 30 feet minimum at 60 degrees Fahrenheit and 27 feet minimum at the maximum operating temperature. The lines will have a single-shield wire with an integrated fiber optic cable for communications.

Single-pole steel structures ranging from 100 to 125 feet high will be used for both the L-Line and IID Midway interconnections. Approximately 132 structures spaced 800 to 1,200 feet apart would be necessary for both lines, depending on final design. The phase conductors will be arranged vertically on three 9.75-foot side arms for each line. The arms are separated vertically 16.9 feet. Figures 3.3-13 and 3.3-14 depict drawings of the double-circuit and single-circuit towers, respectively.

All steel pole towers will have concrete foundations designed to support the imposed loads. The diameter and the depth of each foundation will be determined during the design phase of construction, and will be based on soil conditions and actual tower loads. The maximum anticipated size of the foundation is 10 feet in diameter by 30 feet deep. Excavations for foundations would be made with drilling equipment. A vehicle-mounted power auger or backhoe would be used to excavate for the structure foundations.

Footings will be installed by placing reinforcing steel and anchor bolt cage into each foundation hole, positioning the bolt cage, and encasing it in concrete. Spoil material would be used for fill where suitable. Spoil materials that cannot be used for fill would be removed to a suitable location by the construction contractor for disposal. The foundation excavation and installation would require access to the site by a power auger or drill, a crane, material trucks, and ready-mix trucks.

3.3.6.5 Access to Structures

The construction, operation and maintenance of the proposed transmission lines will require that heavy vehicles access structure sites along the ROW. Use of existing public roads and maintenance roads within existing transmission lines ROW, to the greatest extent possible, is planned to minimize potential impacts associated with new construction. Where necessary, certain road improvements would be made to allow passage of construction vehicles. Following construction, disturbed road sections would be restored to original contours. Some permanent road improvements may be left in place where necessary for operation or maintenance, or where the landowner or land managing agency requires. Road standards will be addressed specifically in the construction, operations, and maintenance (COM) plan that will be prepared during the engineering phase of this project.

New access roads to the structure sites, or spur roads, may be constructed into the ROW from existing transmission line maintenance roads where terrain would prevent access over undisturbed surfaces. Wherever possible, new roads will be built at right angles to existing maintenance roads. All existing roads will be left in a condition equal to or better than their condition prior to the construction of the transmission line.

Culverts or other drainage structures will be installed only as necessary to allow passage of heavy equipment across drainages. This type of temporary facility will prevent damage to existing drainage banks by directing all traffic in a specified area. Existing paved and unpaved highways and roads will be used to the greatest extent possible. Additionally, road construction will include dust control and erosion control measures in sensitive areas. Either the use of water or road sealant emulsion will be applied to non-paved access roads to control fugitive dust emissions.

All roads will be constructed in accordance with IID requirements for transmission line access roads. In case of a conflict between IID requirements and the requirements of the BLM, USFWS, state or other agencies, the requirements of the agency with specific land management jurisdiction would take precedence in such areas. Private land owners along the proposed roads will be consulted before construction begins.

The contractor will be required to prepare a specific Access Road Use Plan to address use of the existing road network to haul workers, materials, and heavy equipment to the staging areas, structure locations, concrete batch plants, and material storage locations. The planned use of existing roads will be evaluated to determine the best approach to mitigate potential impacts to the roads and adjacent construction areas. The installation of culverts and other road improvement amenities will be reviewed and addressed site-by-site. Construction activities will not be allowed to begin until after the Access Road Use Plan is approved.

3.3.6.6 Salton Sea Unit 6 Energy Project Transmission System Evaluation

The Applicant applied to IID to interconnect the proposed generating plant the IID grid. IID performed a System Impact Study to examine the impact of a new 185 MW geothermal plant in the Salton Sea region near Calipatria, California. The System Impact Study determined the impact on the IID system based on power flows on the existing transmission lines and transformers, short circuit duties of the existing transmission facilities, and stability of the interconnected system, considering various contingencies and fault conditions. The proposed plant does not create any system impact or stability problems. SSU6 can be interconnected with the IID transmission system with the plan of service and the mitigation plan described in Appendix P. The addition of SSU6 within IID's control area does not degrade IID's transmission system. The addition of SSU6 and related transmission lines will increase operator flexibility for maintaining the transmission system during steady state and contingency conditions.

3.3.6.7 Transmission System Reliability Criteria

The North American Electric Reliability Council (NERC), the Western System Coordinating Council (WSCC), the ISO and the IID Reliability Criteria for Transmission System Planning were used in the evaluation of the transmission system.

3.3.6.8 Transmission System Interconnection Study

The analysis indicates that the proposed project can be connected to the IID system at the new substation to be constructed as part of the SSU6 Project. The System Impact Study for SSU6 is included in Appendix P.

3.4 PROJECT CONSTRUCTION

The overall project schedule for the SSU6 Project from Limited Notice to Proceed (Procurement of Major Materials) to total Construction Site Cleanup and Demobilization is expected to take at least 23 months. Construction and startup of the power plant from the start of site mobilization to commercial operation is expected to take at least 19 months. The schedule and staffing requirements are described in the following sections by major project components.

3.4.1 Power Plant Facility

3.4.1.1 Project Schedule and Workforce

Construction would begin in March 2003, assuming a 6-month fast-track permitting process. The overall project staffing schedule is displayed in Table 3.4-1. The construction schedule is based on a single-shift, 8 hours/day, 5 days/week workweek, and facility startup schedule is based on a two-shift, 24 hours/day, 7 days/week workweek. Overtime and shift work for construction may be used to maintain or enhance the construction schedule.

Separate contractors working in parallel with the project's construction and startup schedule will construct offsite utilities.

Table 3.4-1 indicates the projected total plant construction workforce by month for the project. An estimated peak of 449 craft and professional construction workforce on site is anticipated in the fourteenth month following start of construction.

Construction will start in the sixth month, with initial work, including site grading and storm water control. Gravel will be used for temporary roads, lay down, and work areas.

Most construction workers will park off site in an area adjacent to the project site. The area will be maintained for stability and safety. The laydown area is identified in Figure 3.3-1A.

3.4.1.2 Execution Plans – Engineering and Construction Phases

The general contractor will provide the following site services.

- Environmental health safety training
- Site security
- Site first aid
- Construction testing (e.g., non-destructive examination, hydro)
- Site fire protection and extinguisher maintenance
- Furnishing and servicing of sanitary facilities
- Trash collection and disposal
- Disposal of hazardous materials and waste in accordance with local, state, and federal regulations.

3.4.1.2.1 Construction Facilities

Mobile trailers or similar suitable facilities (e.g., modular offices) will be used as construction offices for owner, contractor, and subcontractor personnel. These construction facilities will be located at the construction laydown area, shown on 3.3-1A. Some visitor parking will be available in an area adjacent to the construction offices.

3.4.1.2.2 Construction Parking

Construction parking during construction at the main site is southeast of the plant facility. This parking area is approximately 4 acres and may be fenced during the construction period.

3.4.1.2.3 Laydown and Storage

An area of approximately 20 acres south of the plant site is devoted to equipment and materials laydown, storage, construction equipment parking, small fabrication areas, and office trailers. The construction laydown area is outlined in Figure 3.3-1A. Layout of access roads and loading areas is important in the development of the laydown yard. Space is required for large turbine parts, structural steel, piping spools, electrical components, switchyard apparatus, and building parts. Sufficient space is provided to accommodate equipment preventive and in-storage maintenance activities such as moving, shaft rotation, connecting, lubricating, and heating. Site access will be controlled for personnel and vehicles. A security fence will be installed around the site boundary, including the laydown area. Security personnel will be on site.

3.4.1.2.4 Emergency Facilities

Emergency services will be coordinated with the local fire department and hospital. First-aid kits will be provided around the site and regularly maintained. At least one person trained in first aid will be part of the construction staff; additionally, all foremen and supervisors will be given first-aid training.

Fire extinguishers will be located throughout the site at strategic locations at all times during construction.

3.4.1.2.5 Construction Utilities

Temporary utilities will be provided for the construction offices, the laydown area, and the project site. Temporary construction power will be supplied by a temporary generator and, when available, at the site by utility-furnished power. Area lighting will be provided and strategically located for safety and security. Canal water will be used for construction water. Drinking water will be imported and distributed daily. Portable toilets will be provided throughout the site. During hydrotest, water usage will increase. Used hydrotest water will be discharged through the oil/water separator into the storm water detention ponds.

3.4.1.2.6 Construction Equipment and Materials Delivery

Construction equipment planned for use in the construction of the SSU6 Project is listed in Table 3.4-2. Truck deliveries will occur weekdays between 8:00 a.m. and 4:30 p.m. The estimated daily averages frequency of truck deliveries is shown in Table 3.4-3. Materials such as concrete, pipe, wire and cable, fuels, reinforcing steel, and small tools and consumables will be delivered to the site by truck.

3.4.2 Production/Injection Wells and Pipelines

Well drilling operations are conducted 24 hours a day, seven days a week until the total depth is reached. An estimated eight weeks will be required to drill each well, and approximately 12 people will be working at each site at any one time. A diesel auger drilling rig would be used to construct the production and injection wells.

Site preparation, including drill rig assembly, should require approximately one to two weeks per well. Preparation of a typical drilling site would involve grading (clearing and leveling) approximately 1 to 1.5 acres (0.4 to 0.6 ha) per well, which would contain an equipment staging and activity area, a drill pad and a mud sump. Well drilling operations are regulated by the CDOGGR. CDOGGR regulations cover the drilling program, the casing program, and the provision of blowout protection equipment.

A system of aboveground pipelines will be constructed to connect the power plant with the production and injection wells. Wherever possible, these pipelines will be placed next to the borders of fields or along access roads to minimize the amount of land affected.

Production and injection headers would be made of carbon steel pipe, 24 to 30 inch in diameter. Production headers are designed for a code pressure rating of 600 psig, and injection headers are designed for a code pressure rating of 300 psig. The carbon steel material used is API (American Petroleum Institute) classification 5L, grade B, X42. Depending on the pressure rating and size of pipe, the steel thickness will vary between 0.6 inch and 1.0 inch. For protection against corrosion, a polymer concrete lining of approximately 0.5-inch thickness is applied to the inside diameter of the pipe prior to shipment to the site. The polymer concrete coating is applied at a shop specifically qualified for this work, and the pipe is hydroblasted prior to applying the concrete to remove any rust material to assure proper bonding of the concrete to the pipe. A quality assurance and inspection program is also used to assure a high quality product. A cure time of 2 to 4 days is required for the concrete lining. The pipe would be shipped to the SSU6 Project site in 40-foot-long segments. During storage and shipping, the pipe is filled with water to prevent drying or cracking of the liner.

The pipe would be field welded during assembly. Only certified welders would perform the work. Welding procedures are developed in accordance with the latest edition of ASME power piping code B31.1. The welding would be subject to 100 percent X-ray for testing. Any portions that fail testing would be ground out, re-welded, and re-tested. After assembly, each pipeline would be subjected to a hydrostatic test at 150 percent of the system normal operating pressure. Test pressure is held for sufficient time to walk the entire length of the pipeline and inspect for leaks.

Qualified mechanical engineers would design the pipelines. Because the pipelines are long and operate at temperatures up to 400 degrees Fahrenheit (F), a major design consideration is thermal expansion. The pipeline design is modeled using stress analysis software programs to determine the best location and spacing requirements of thermal expansion loops. For personnel protection and to prevent energy loss, the pipelines are covered with 4 inches of insulation. The insulation is covered with an aluminum jacket for protection. Flanges and valves are wrapped with removable insulation jackets.

Pipeline construction would consist of various activities, including, but not limited to, clearing and grubbing, excavation for pipeline supports, pipe handling and welding. Site clearing and preparation (removing vegetation and minor leveling) would require the use of heavy diesel-powered earthmoving equipment, including bulldozers, scrapers, dump trucks, and front-end loaders. Site clearing and preparation would occur at all locations where equipment would be constructed or installed. The ROW would be prepared by removing debris and land leveling as each component is being constructed. Erosion control measures would include reducing time between clearing and construction and installing silt fencing. Surplus soils that cannot be used for restoration on site would be sent to a soils broker or the local, state-approved landfill.

3.4.3 Transmission Lines

3.4.3.1 Project Schedule and Workforce

Construction of the new electrical transmission lines is estimated to take approximately twelve months. Table 3.4-1 indicates the projected total plant construction workforce by month for the transmission lines.

3.4.3.2 Preconstruction Survey Activities

Biological, cultural, and geotechnical surveys have been completed for the project. Preconstruction survey work would consist of locating the centerline, structure center hubs, ROW boundaries, and structure access roads. Additional biological surveys would also be necessary prior to construction to confirm the information previously observed . These surveys would be initiated following ROW and access road identification and marking. Prior to the initiation of any preconstruction surveys the necessary survey permits for federal and state lands, as well as rights-of-entry to privately owned land, would be obtained.

3.4.3.3 Right-of-Way Acquisition

Internal IID requirements, the National Electrical Safety Code (NESC), and operational considerations determine the width of the ROW. Specific ROW requirements depend on the structure type, height, span, and conductor configuration. IID generally requires ROWs that are the height of the structure on either side of the centerline to avoid issues associated with structure failure. An additional ROW distance of 50 feet is required to allow equipment access in case of a collapsed structure. The heights of the single steel pole structures for the SSU6 lines would range from 100 to 125 feet. Providing for a tip-over range of 130 feet for maximum height structures and adding an additional 20 feet for maintenance access results in an overall ROW width of 150 feet. The Proposed Project transmission line would be located immediately adjacent to the existing County road ROW where possible, which is 50 feet wide.

On federally managed public lands, a Grant of ROW would be required from the BLM. On state managed public lands, a Land Use Lease would be required from the California State Lands Commission or other appropriate state land management agencies. On private land, sufficient easements will be acquired to locate, construct, operate, and maintain the transmission facility. All land rights will be acquired in accordance with applicable state laws governing acquisition of property rights. Landowners will be paid fair market value for the rights acquired across their property, and any damages resulting from construction, operation, and maintenance.

3.4.3.4 Construction Activities

Construction of a transmission line follows the sequence of access road identification and construction, ROW and structure sites clearing (including construction yards and foundation concrete mixing areas, or “batch plants”), installing foundations, assembling and erecting the structures, clearing, pulling (i.e., stringing individual transmission lines through conductors), tensioning, and splicing sites, installing ground wires and conductors, installing counterpoise/ground rods, and cleanup and site reclamation. Various phases of construction would occur at different locations throughout the construction process. This would require several construction crews operating simultaneously in different locations. Figure 3.4-1 depicts the typical construction procedures for installation of transmission line structures and wires. Table 3.2-2 lists temporary and permanent disturbance for the Proposed Project.

3.4.3.4.1 Access Road Construction

The construction, operation, and maintenance of the proposed transmission line would require that heavy vehicles access structure sites along the ROW. Use of existing maintenance roads within existing transmission lines ROWs to the greatest extent possible is planned to minimize potential impacts associated with new access road construction. Where necessary, certain road improvements would be made to allow passage of construction vehicles. Following construction, disturbed road sections would be restored to original contours. Some permanent road improvements may be left in place where necessary for operation or maintenance, or where the landowner or land managing agency requires. Specific road standards would be developed during the detailed engineering phase of this project.

New access roads to the structure sites, or spur roads may be constructed into the ROW from existing transmission line maintenance roads where terrain would prevent access over undisturbed surfaces. Wherever possible, new roads would be built at right angles to existing maintenance roads. Additionally, road construction would include dust control and erosion control measures in sensitive areas. All existing roads would be left in a condition equal to or better than their condition prior to the construction of the transmission line.

Culverts or other drainage structures would be installed only as necessary to allow passage of heavy equipment across drainages. This type of temporary facility would prevent damage to existing drainage banks by directing all traffic in a specific area. Existing paved and unpaved highways and roads would be used to the greatest extent possible.

All roads would be constructed in accordance with IID requirements for transmission line access roads. In case of a conflict between IID requirements and the requirements of the BLM, USFWS, state or other agencies, the requirements of the agency with specific land management jurisdiction would take precedence in such areas. Private landowners along the proposed roads would be consulted before construction begins.

The contractor would be required to submit a specific plan to address use of the existing road network to haul workers, materials, and heavy equipment to the staging areas, structure locations, concrete batch plant sites, and material storage locations. The planned use of existing roads would be evaluated to determine the best approach to mitigate potential impacts to the roads and adjacent construction areas. The installation of culverts and other road improvement amenities would be reviewed and addressed site-by-site.

3.4.3.4.2 Structure Sites

At each structure site, leveled areas (i.e., pads) would be needed to facilitate the safe operation of equipment, such as construction cranes. The leveled area required for the location and safe operation of large cranes would be approximately 30 by 40 feet. At each structure site, a work area of approximately 200 feet square would be required for the location of structure footings, assembly of the structure, and the necessary crane maneuvers. The work area would be cleared of vegetation only to the extent necessary. After line construction, all pads not needed for normal transmission line maintenance would be restored to natural contours to the greatest extent possible and be revegetated where required.

3.4.3.4.3 Clearing and Grading within Right-of-Way

Clearing and grading would be conducted only as necessary at construction areas for the safe movement of vehicles and construction activities. Estimated land disturbance associated with the transmission line construction is shown in Table 3.2-2.

3.4.3.4.4 Foundation Installation

Excavations for foundations would be made with power drilling equipment. A vehicle-mounted power auger or backhoe would be used to excavate for the structure foundations. In rocky areas, the foundation holes would be excavated by drilling. Although not expected, in some instances blasting could be necessary if necessitated by site-specific geologic conditions. In the unlikely event that blasting is necessary, conventional or plastic explosives would be used. Safeguards (e.g., blasting mats) would be employed when adjacent areas require protection.

Footings would be installed by placing reinforcing steel and an anchor bolt cage into each foundation hole, positioning the bolt cage, and encasing it in concrete. Spoil material would be used for fill where suitable. Spoil materials that cannot be used for fill would be removed to a suitable location by the construction contractor for disposal. The foundation excavation and installation would require access to the site by a power auger or drill, a crane, material trucks, and ready-mix trucks.

3.4.3.4.5 Staging Areas

Temporary staging areas would be located at the SSU6 plant site, near the end of the transmission line ROW, and approximately every 4 to 5 miles along the route. These areas would be located in previously disturbed sites wherever possible, and would be approximately 300 by 900 feet. Concrete for use in constructing foundations would be dispensed from a portable concrete batch plant. The portable batch plant would be moved from staging area to staging area following tower foundation construction activities. Raw materials would be stored within the site. Additionally, the batch plant sites would be of sufficient size to serve as staging areas for construction in general as well as vehicle for parking.

Commercial ready-mix concrete may be used when access to structure construction sites is economically feasible. Concrete admixtures would be used to increase the maximum allowable concrete delivery time.

Materials and water required for mixing concrete would be delivered to the batch plant by truck as needed to meet foundation construction schedules. The sources of the materials would be from existing concrete suppliers in the project area. Water would be obtained from the IID canal on the west and from currently available sources on the east. Water trucks would be used to replenish portable water towers that would be located at batch plant sites. The single-pole tubular steel tower structure foundations would be approximately 10 feet in diameter and 30 feet deep. The water requirement for mixing the concrete for these foundations is estimated to be 1.35 acre-feet.

The construction yards would serve as field offices, reporting locations for workers, parking space for vehicles and equipment, sites for material storage, and stations for equipment maintenance. Facilities would be fenced where necessary and their gates locked. Security guards would be stationed where needed.

Final locations of the construction yard sites would be determined through an approval submittal process involving the project proponents, landowners, and land management agencies. A rubber-tired flatbed truck and tractor would be used to relocate each batch plant along the ROW as construction proceeds.

3.4.3.4.6 Structure Assembly and Erection

Structural steel components and associated hardware would be shipped to each structure site by truck. Steel structure sections would be delivered to tower locations where they would be fastened together to form a complete structure and hoisted into place by a large crane.

3.4.3.4.7 Conductor Installation

After the structures are erected, insulators, hardware, and stringing sheaves would be delivered to each structure site. The structures would be rigged with insulator strings and stringing sheaves at each ground wire and conductor position.

For public protection during wire installation, guard structures would be erected adjacent to highways, railroads, power-lines, structures, and other obstacles. Guard structures would consist of H-frame poles placed on either side of an obstacle. These structures would prevent ground wire, conductor, or equipment from falling on an obstacle, and would be removed following the completion of equipment installation. Equipment for erecting guard structures would include augers, line trucks, pole trailers, and cranes. Guard structures may not be required for small roads or other areas where suitable safety measures such as barriers, flagmen, or other traffic control could be used.

Pilot lines would be pulled (strung) from structure to structure and threaded through the stringing sheaves at each structure. Following pilot lines, a larger diameter, stronger line would be attached to conductors to pull them onto structures. This process would be repeated until the ground wire or conductor is pulled through all sheaves.

The shield wire and conductors would be strung using powered pulling equipment at one end and powered braking or tensioning equipment at the other end of a conductor segment. Sites for tensioning equipment and pulling equipment would be approximately 2 miles apart. This distance will be essentially doubled where it is prudent to do so by pulling in two sets of conductors back to back.

Each tensioning site would be an area approximately 200 feet by 200 feet. Tensioners, line trucks, wire trailers, and tractors needed for stringing and anchoring the ground wire or conductor would necessary at each tensioning site. The tensioner in concert with the puller would maintain tension on the shield wires or conductors while they are fastened to the structures. The pulling site would require approximately half the area of the tension site. A puller, line trucks, and tractors needed for pulling and temporarily anchoring the shield wires and conductor would be necessary at each pulling site.

3.4.3.4.8 Ground Rod Installation

Part of standard construction practices prior to wire installation would involve measuring the resistance of structure footings. If the resistance to remote earth for each transmission structure is greater than 25 ohms, additional ground rods would be installed to lower the resistance below 25 ohms.

3.4.3.4.9 Cleanup

Construction sites, material storage yards, and access roads would be kept in an orderly condition throughout the construction period. Approved enclosed refuse containers would be used throughout the project. Refuse and trash would be removed from the sites and disposed of in an approved manner. Oils and fuels would not be dumped along the line. Oils or chemicals would be hauled to a disposal facility authorized to accept such materials. No open burning of construction trash would occur without agency approval.

3.4.3.4.10 Site Reclamation

The ROW would be restored as required by the property owner or land management agency. All practical means would be made to restore the land to its original contour and to restore natural drainage patterns along the ROW. Because revegetation would be difficult in many areas of the project as precipitation is minimal, it would be important to minimize disturbance during the construction. All practical means would be made to increase the chances of any vegetation reestablishment in disturbed areas.

3.4.3.4.11 Hazardous Materials within Corridor

Petroleum products such as gasoline, diesel fuel, crankcase oil, lubricants, and cleaning solvents would be present within the transmission line corridor during construction. These products would be used to fuel, lubricate, and clean vehicles and equipment, and would be transported in containerized trucks or in other approved containers. When not in use, hazardous materials would be properly stored to prevent drainage or accidents.

Hazardous materials would not be drained onto the ground or into streams or drainage areas. Totally enclosed containment shall be provided for all hazardous waste. All construction waste, including trash and litter, garbage, other solid waste, petroleum products, and other potentially hazardous materials, would be removed to a disposal facility authorized to accept such materials.

All construction, operation, and maintenance activities would comply with all applicable federal, state, and local laws and regulations regarding the use of hazardous substances.

The construction or maintenance crew foreman would ensure compliance with all applicable laws and regulations. Additionally, an onsite inspector would be present during construction to make sure that all hazardous materials are used and stored properly. In case of a hazardous materials spill, notification and cleanup would be undertaken by construction contractors' certified personnel in an expeditious manner.

3.4.3.4.12 Fire Protection

All applicable fire laws and regulations would be observed during the construction period. All personnel would be advised of their responsibilities under the applicable fire laws and regulations, including taking practical measures to report and suppress fires.

3.5 FACILITIES, OPERATIONS, AND MAINTENANCE

3.5.1 Introduction

The SSU6 Project is expected to have an operating life of 30 years. Reliability and availability are based on this projected operating life. The SSU6 Project is a generating facility designed for the restructured California energy market. The plant design and operating philosophy will be based on operation as a merchant plant in the competitive California electricity market, with a high emphasis on efficiency and flexibility.

The SSU6 Project is expected to be operated by a staff of approximately 69 full-time, onsite employees. The facility will be capable of operation seven days per week, 24 hours per day. Plant operations will be controlled from the operator's panel, which will be located in the Control Room. A distributed control system will provide modulating control, digital control, and monitoring and indicating functions for operation of the resource production facility and power generation facility systems.

3.5.2 Power Plant Facility

3.5.2.1 Merchant Plant Operation

The proposed project will be a merchant plant that will supply capacity and energy to California's electric market. The Applicant has contracted the vast majority of the electrical output from the plant with IID for a period of 20 years following completion. The remaining energy will either be sold to the California ISO, via the IID, or contracted to third parties via the IID.

3.5.2.1.1 Annual Operating Practices

Generally, the plant will be operated to provide its maximum electrical output throughout the year. To start the plant from a zero percent dispatched operating mode, power will be backfed through the L-Line Interconnection to bring the facilities on-line. Auxiliary systems and the resource production facility will be started up first. After production of turbine-quality steam has been confirmed, steam will be directed to the turbine. After achieving full speed, the turbine generator will be synchronized with the transmission grid.

Planned maintenance will be coordinated to reduce the impact of having a unit shutdown for maintenance and overhauls. Normally, this work will be planned during the spring periods when the need for electricity is reduced.

3.5.2.1.2 Operation with Daily and Seasonal Variation in Temperature and Demand

Output from the power generation facility is sensitive to the ambient wet bulb and dry bulb temperatures, which impact the cooling capacity of the cooling towers, and which vary during the course of the year. The cooling tower will therefore be designed with sufficient capacity for ambient temperature during the summer peaks, when the electrical customers' usage is at its highest.

3.5.2.1.3 Startup and Shutdown

The time required for startup of the plant is approximately 45 hours when the plant has been completely shut down (cold startup) and all brine flow to the plant has been secured for an extended period. This event is projected to occur approximately once per year.

A warm start would occur when the turbine is taken off line and the RPF continues to operate. A startup in this condition will require approximately four hours. It is anticipated that at least four starts and stops per turbine would occur over one year following short-term outages, for a total of at least five starts and stops per year.

3.5.2.2 Control Philosophy

The control system will consist of a state-of-the-art, integrated microprocessor-based DCS. The control system will provide for startup, shutdown, and control of plant operation limits, and shall provide protection for the equipment. Interlock and logic systems will be provided with hardwired relays, the DCS, or programmable controllers. Process switches (i.e., pressure, temperature, level, etc.) used for protective functions will be connected directly to the DCS and the protective system.

3.5.2.3 Degree of Automation and Control Systems

The plant will be designed with a high degree of automation to reduce the required actions performed by operating personnel. Where it is not beneficial, systems will not be automated. Through subsystem automation and a distributed control system, the number of individual control switches and indicators that confront the operator will be greatly reduced. This will reduce the complexity and size of the main control room consoles and panels.

Most equipment required to support the operation of the plant will be located in the control room. The control room contains the DCS CRT-type control consoles and the auxiliary control panels. Additionally, the control room contains the alarm, utility, and log printers.

Local control panels or stations will be furnished only where operator attention is required to set up a system for operation, or where the equipment requires intermittent attention during plant operation. Main control room indication and control will only be duplicated for those variables critical to plant availability.

Functionally distributed and redundant microprocessor-based subsystem controllers will communicate with the main control room via a redundant high-speed communications network. The communications network will provide unit-wide data access for centralized operation and engineering functions through CRTs. Remote I/O capability will be provided to allow the DCS to interface with remote equipment and to reduce the quantity of long cable runs.

The DCS will perform the following functions and miscellaneous tasks:

- Perform analog and digital plant control functions to accommodate a consistent operator interface for controlling the power plant equipment
- Monitor both analog and digital signals to provide the operator/engineer with access to the data around the network
- Perform alarm monitoring in the main control room for the entire plant
- Provide graphic displays for all systems and equipment, including electrical systems and controller faceplates
- Provide data logging and reporting via displays and printed reports
- Provide long-term data storage of process history.

3.5.3 Transmission System Operation and Maintenance

Operation of the transmission system will be controlled by the IID. IID will own and maintain the transmission system, including the switchyard, down stream of the plant high-voltage disconnect switch and 161 KV plant circuit breaker. Anticipated IID maintenance activities for the transmission system are described as follows:

- Access ways to poles and structures will be provided, as required. All access ways will be maintained to minimize erosion and to allow access by the maintenance crew.
- Land use activities within and adjacent to the transmission line ROW will be permitted within the terms of the easement. Incompatible uses of the ROW include buildings and tall trees that interfere with required line clearances, as well as storage of flammable materials, or other activities that compromise the safe operation of the transmission line.
- The transmission line would be inspected regularly by both ground and air patrols. Maintenance would be performed as needed.
- Emergency repairs will be made if the transmission line is damaged and requires immediate attention. Maintenance crews will use tools and other such equipment, as necessary, for repairing and maintaining insulators, conductors, structures, and access ways. When access is required for non-emergency maintenance and repairs, IID would adhere to the same precautions identified for original construction.
- The buildup of particulate matter on the ceramic insulators supporting the conductors on electrical transmission lines increase the potential for flashovers, which affects the safe and reliable operation of the line. Structures with buildup of particulate matter are identified for washing during routine inspections of the lines. Washing operations consist of spraying insulators with deionized water through high-pressure equipment mounted on a truck.

3.5.4 Water Supply System Maintenance

Operation of the water supply pipeline will be in accordance with general industry standards. The pipeline will receive periodic inspection as part of SSU6's maintenance program.

3.6 FACILITY CLOSURE

Facility closure can be either temporary or permanent. Facility closure can result from two circumstances: (1) The facility is closed suddenly and/or unexpectedly because of unplanned circumstances, such as a natural disaster or other unexpected event; or (2) The facility is closed in a planned manner, such as at the end of its useful economic or mechanical life or because of gradual obsolescence. The two types of closure are discussed in the following sections.

3.6.1 Temporary Closure

Temporary or unplanned closure can result from numerous unforeseen circumstances, ranging from natural disaster to economic forces. For a short-term unplanned closure, where there is no facility damage resulting in a hazardous substance release, the facility would be kept "as is", ready to re-start operations when the unplanned closure event is rectified or ceases to restrict operations. If there is a possibility of hazardous substances release, the Applicant will notify the CEC compliance unit and follow emergency plans that are appropriate to the emergency. Depending on the expected duration of the shutdown, chemicals may be drained from the storage tanks and other equipment. All wastes (hazardous and nonhazardous) will be disposed of according to LORS in effect at the time of the closure. Facility security will be retained so that the facility is secure from trespassers.

Prior to the beginning of operations, the Applicant will develop a contingency plan to deal with unplanned or unexpected plant closure. This plan will include the following elements:

- Taking immediate steps to secure the facility from trespassing and encroachment
- Procedures for the safe shutdown and startup of equipment and procedures for dealing with hazardous materials, including draining of vessels and equipment and disposition of wastes
- Communication with CEC and local authorities regarding the facility damage and compliance with LORS

3.6.2 Permanent Closure

The planned economic life of the SSU6 facility is 30 years. However, if the facility were economically viable at the end of the 30-year operating period, it could continue to operate for a much longer period. As power plant operators continuously maintain the equipment up to industry standards, there is every expectation that the generation facility will have value beyond 30 years. It is also possible that the facility could become economically non-competitive earlier than the planned power plant's 30-year useful life. Decommissioning activities will follow a decommissioning plan that will be developed and submitted to the CEC for review at least 12 months prior to planned facility closure. The permanent closure plan will include the following elements:

- Activities required to permanently close the facility
- A listing of all applicable LORS and a plan to comply with them
- Coordination with CEC and interested local authorities, including workshops, to coordinate closure activities
- The maximization of recycling and other proper disposal methods, and
- The maintenance of site security, as required.

In case of permanent closure, the facility will be cleaned and the facility components will be salvaged to the greatest extent possible. Cleaning will consist of removal of scale from piping and equipment walls (primarily brine-handling piping and equipment) and the removal of sludge from the primary and secondary clarifiers, the brine pond, and the cooling tower basin. All solids will be tested. Those found to be hazardous will be transferred to a permitted Class I landfill. Nonhazardous wastes will be transferred to a permitted Class II or Class III landfill as appropriate for each waste. These solids will be managed and disposed of properly so as not to cause significant environmental or health and safety impacts.

Under permanent closure, the wells will be abandoned with proper certification using CDOGGR procedures.

3.7 PROJECT FEATURES TO AVOID OR REDUCE ENVIRONMENTAL IMPACTS

The SSU6 Project has been designed and engineered with numerous features to avoid or reduce potential environmental impacts. These features have been described previously in this section and are summarized in Table 3.7-1.

3.8 REFERENCES

Geotechnics Incorporated, 2002, Geotechnical Investigation, Geothermal Powerplant, Salton Sea Unit No. 6, Calipatria, California, Project No. 0673-002-00, Document No. 02-0022, February 5.

The Energy and Geoscience Institute at the University of Utah. 2002.

Federal Energy Management Agency. 1984.

Imperial County Planning/Building. Department. 1993. Imperial County General Plan, 1993. Geothermal and Transmission Element.

Table 3.2-1
SALTON SEA KGRA DEVELOPMENT HISTORY

Plant	[Net MW]	Startup Date
Unit 1	10.0	1982
Vulcan/CE Turbo	44.0	1986/2000
Del Ranch (Hoch)	38.0	1989
Elmore	38.0	1989
Unit 3	49.8	1989
Leathers	38.0	1990
Unit 2	20.0	1990
Unit 4	39.6	1996
Unit 5	49.0	2000
Total Existing	326.4	

Table 3.2-2
ESTIMATED AREA OF DISTURBANCE FOR THE SSU6 PROJECT

	Length (miles)	Area of Disturbance		Acres	
		Temporary	Permanent	Temporary	Permanent
Energy Facility	N/A		80 acres	80.0	80.0
Substation	N/A	700' x 700'	700' x 700'	11.0	11.0
Construction Lay-down Area at Plant Site	NA	1300' x 675'	N/A	20.0	0
Production Wells	N/A	5 pads (4 pads at 300'x700' each, and 1 pad 560'x560') (1) with 10 Production wells	5 pads (4 pads at 300'x700' each, and 1 pad 560'x560') (1) with 10 Production wells	26.2	26.2
Injection Wells	N/A	3 pads (3 pads at 300'x700' each) with 6 Injection wells	3 pads (3 pads at 300'x700' each) with 6 Injection wells	15.4	15.4
Production Pipelines	1.0	100' ROW plus 10% for expansion joints for 1 mile	100' ROW plus 10% for expansion joints for 1 mile	13.3	13.3
Injection Pipelines	6.0	100' ROW plus 10% for expansion joints for 3 miles	100' ROW plus 10% for expansion joints for 3 miles	40.0	40.0
L-Line Interconnection Pole Locations	N/A	1 Acre each for 89 Towers	30'x40' = 0.03 Acres for Each Pole	89.0	2.7
L-Line Interconnection Access Roads on BLM Land	2.8	25 feet wide between pole sites	25 feet wide	5.2	6.6
IID Midway Interconnection Pole Locations	N/A	1 Acre each for 88 Towers	30'x40' = 0.03 Acres for Each Pole	88.0	2.6
Staging and Laydown Areas Along Transmission Routes	N/A	5 Staging/Laydown Areas along L-Line Interconnection, 3 Staging/Laydown Areas along IID Midway Interconnection All at 6 acres each	N/A	48.0	0
Construction Parking Area	N/A	550' x 350'	N/A	4.4	0
Pull Sites	N/A	1 Pull Site for Every 2 miles along Transmission Routes	N/A	39	0
Total Disturbance	N/A	N/A	N/A	479.5	197.8

Notes: N/A Not Applicable;

(1) 1.7 acres of OB5 is currently disturbed

Table 3.3-1
EXPECTED CHEMICAL COMPOSITION OF PRODUCED FLUIDS
CONSTITUENT CONCENTRATION
(ppm)

Hydrogen (H^{+})	ND
Lithium (Li^{+})	187
Beryllium (Be^{+2})	ND
Ammonium (NH_4^{+})	369
Sodium (Na^{+})	50,169
Magnesium (Mg^{+2})	39
Aluminum (Al^{+3})	ND
Potassium (K^{+})	12,784
Calcium (Ca^{+2})	24,584
Chromium (Cr^{+3})	ND
Manganese (Mn^{+2})	983
Iron (Fe^{+2})	1,180
Nickel (Ni^{+2})	ND
Copper (Cu^{+2})	4
Zinc (Zn^{+2})	320
Rubidium (Rb^{+})	69
Strontium (Sr^{+2})	443
Silver (Ag^{+})	ND
Cadmium (Cd^{+2})	1
Antimony (Sb^{+3})	1
Cesium (Cs^{+})	12
Barium (Ba^{+2})	177
Mercury (Hg^{+2})	ND
Lead (Pb^{+2})	79
Bicarbonate (HCO_3^{-})	69
Nitrate (NO_3^{-})	ND
Fluorine (F^{-})	20
Sulfur Monoxide (SO_1^{-2})	98
Chlorine (Cl^{-})	137,670
Arsenate (AsO_4^{-3})	20
Selenate (SeO_4^{-2})	ND
Bromine (Br^{-})	89
Iodine (I^{-})	10
Silicon Dioxide (SiO_2)	433
Carbon Dioxide (CO_2)	3,309
Boric Acid ($B[OH]_3$)	1,800
Hydrogen Sulfide (H_2S)	15
Ammonia (NH_3)	59
Methane (CH_4)	10
Total Dissolved Solids (TDS)	235,000
Potential of Hydrogen (pH)	5.5

ND = Not Detected

Table 3.3-2
COOLING TOWER BLOWDOWN AND
INJECTED PROCESS BRINE FLUID CHARACTERIZATION
(mg/L as Ions)[1]

Constituent	Cooling Tower Blowdown	Clarifier	Brine Pond
Lithium	0.067	228.5	253.3
Beryllium	0.000	0.01	0.01
Ammonium	376.573	451.1	500.0
Sodium	18.077	61,369.2	68,024.0
Magnesium	0.014	48.9	53.3
Aluminum	0.000	0.3	0.3
Potassium	4.606	15,637.1	17,333.3
Calcium	8.858	30,073.4	33,333.3
Chromium	0.000	0.004	0.004
Manganese	0.354	1,202.8	1,333.3
Iron	0.425	1,443.4	1,600.0
Nickel	0.000	0.02	0.03
Copper	0.001	4.8	5.3
Zinc	0.115	390.9	433.3
Rubidium	0.025	84.2	93.3
Strontium	0.159	541.3	600.0
Silver	0.000	0.3	0.3
Cadmium	0.000	1.5	1.7
Antimony	0.000	1.0	1.1
Cesium	0.004	15.0	16.7
Barium	0.064	216.5	240.0
Mercury	0.055	0.0001	0.004
Lead	0.028	96.2	106.7
Bicarbonate	0.025	88.6	93.3
Nitrate	0.000	0.01	0.0
Fluoride	0.007	24.1	26.7
Sulfate	699.590	127.5	133.3
Chloride	47.032	168,400.5	186,666.7
Arsenic	0.004	13.2	14.7
Selenium	0.000	0.006	0.007
Bromine	0.032	108.3	120
Iodine	0.004	12.0	13.3
Silica	0.156	206	586.7
Carbon Dioxide	0.000	0.1	2,006.7
Boron	0.113	384.8	426.58
Hydrogen Sulfide	0.000	0.0	20.1
Benzene	0.000	0.0	0.003
Total Dissolved Solids	1168.0	283,323	316,063.4
pH	8.4	**4.5 to 5.1**	**4 to 7**

Constituent	Cooling Tower Blowdown	Clarifier	Brine Pond

[1]Note: All numbers are approximate.

Table 3.3-3
ESTIMATED DAILY WATER SUPPLY REQUIREMENTS

IID Canal Water	Average Usage (design conditions)	Summer Usage (design conditions)
RO Water (Potable, Sanitary, and Domestic Use)	2,160 gpd	2,160 gpd
Dilution Water and Other Process Uses	259,200 gpd	259,200 gpd
Total	**261,360 gpd**	**261,360 gpd**

Table 3.3-4
ANNUAL WATER CONSUMPTION
(Design Conditions[1])

IID Canal Water	Annual Average
RO Water	2.42 acre-ft/year
Dilution Water and Other Process Uses	290.3 acre-ft/year
Total	**292.72 acre-ft/year**

Design conditions are based on 23.5 percent salinity in the brine

Table 3.3-5
EXPECTED WATER QUALITY
(All units ppm as ions, pH)

Constituent	IID Canal Water
Hydrogen	0.3
Sodium	72.5
Magnesium	24.5
Potassium	4.0
Calcium	67.1
Manganese	ND
Iron	ND
Copper	ND
Strontium	1.0
Silver	0.1
Bicarbonate	131.3
Nitrate	0.3
Sulfate	216.4
Chlorine	67.5
Silicon Dioxide	12.6
Carbon Dioxide	2.3
Total Dissolved Solids	600.0
Potential of Hydrogen	7.5

ND = Not Detected

Table 3.3-6
TYPICAL SILICA-BASED FILTER PRESS CAKE COMPOSITION

Major Elements	
Silicon (Amorphous)	52%
Iron	13%
Barium	3%
Calcium	2%
Water	30%
Minor Components	
Sodium	6000 ppm
Strontium	6000 ppm
Manganese	3500 ppm
Potassium	1300 ppm
Arsenic	300 ppm
Copper	250 ppm
Zinc	130 ppm
Trace Components	
Lead	30 ppm
Antimony	10 ppm
Berryllium	10 ppm
Cobalt	4 ppm
Nickel	1.5 ppm
Chromium	1 ppm
Silver	0.4 ppm
Cadmium	0.2 ppm
Radium 226	10 pCi/g
Radium 228	10 pCi/g

Table 3.3-7
SUMMARY OF CONSTRUCTION WASTE STREAMS AND MANAGEMENT METHODS[1]

Waste Stream	Waste Classification	Amount	Treatment
Scrap wood, steel, glass, plastic, paper, calcium silicate insulation, mineral wood insulation	Nonhazardous	25-40 cu yd/wk	Waste disposal facility
Empty hazardous material containers - drums	Recyclable Hazardous	1 cu yd/wk	Recondition or recycle
Used and waste lube oil during Steam Turbine Lube Oil Flushes	Recyclable Hazardous	<55 gallons per flush period, approximately 3 weeks	Recycle
Oil absorbent materials turbine lube oil flushes and normal construction	Nonhazardous	Mats per month, as needed	Waste disposal facility or laundry (permitted to wash rags)
Oily rags generated during normal construction activities lube oil flushes	Nonhazardous	3-4 55 gallon drums a month	Waste disposal facility or laundry (permitted to wash rags)
Spent batteries; lead acid	Hazardous Recyclable	3 batteries/year	Recycle
Spent batteries; alkaline type, Sizes AAA, AA, C and D	Hazardous	72 batteries/month	Waste disposal facility
Sanitary Waste-Portable Chemical Toilets and Construction Office Holding Tanks	Sanitary	440 gpd	Pumped by licensed contractors and transported to sanitary water treatment plant
Drilling Waste	Nonhazardous[3]	300,000-700,000 cubic feet total produced by all well construction	Waste disposal facility

1 Note: All numbers are approximate.

2 Under California regulations.

3 Waste will be tested for hazardous characteristics before disposal. Non-hazardous drilling wastes would go to the Class II Monofill Facility landfill. Hazardous wastes would be sent to a Class I landfill.

Table 3.3-8
OPERATING WASTE STREAMS AND MANAGEMENT METHODS

Waste Stream	Waste Classification	Amount[1]	Treatment
Filter-cake of brine solids from dewatering process	Non-hazardous[2]	120 tons/day	Waste disposal facility
Sulfur byproduct from H_2S abatement system	Non-hazardous[2]	2.5 tons/day	Waste disposal facility
Used hydraulic fluids, oils, grease, oily filters	Recyclable Hazardous	<5 gallons/day	Recycle
Spent batteries; lead acid	Recyclable Hazardous	2 batteries/year	Recycle
Laboratory Waste	Hazardous	600 gallons/year	Waste disposal facility
Activated carbon from Benzene Abatement	Hazardous	13,300 lb/year	Conservatively assumes return to manufacturers for replacement every 3 years
Used oil from oil/water separator	Recyclable Hazardous	100 gallons/month	Recycle
Oily rags	Non-hazardous	55 gallons/2 months	Laundry (permitted to wash oil rags)
Cooling Tower Blowdown	Non-hazardous	621,000 lbs/hr	Dedicated fluid injection well
Clarifier Effluent	Non-hazardous	9,336,000 lbs/hr	Dedicated fluid injection well
Brine Pond	Non-hazardous	2,700,000 gallons/year	Dedicated fluid injection well
Brine Pond Solids	Hazardous	16,700 tons/year	Waste disposal facility
Scale and Cleaning Solvents	Hazardous	150,000 cubic feet every 2-3 years from maintenance	Waste disposal facility

1 Note: All numbers are approximate

2 Waste will be tested for confirmation of non-hazardous characteristics before disposal. Non-hazardous wastes would go to the Class II Monofill Facility landfill. Hazardous wastes would be sent to a Class I landfill. Based on current operations, these wastes typically characterize as non-hazardous waste. If a market develops for these materials, they will be recycled or reused as appropriate.

Table 3.3-9
ANTICIPATED HAZARDOUS CHEMICAL USAGE AND STORAGE[1]

Material[2]	Purpose	Usage/Day[1]	Maximum Amount Stored	Storage Type
Antifoam	Brine handling	132 lb	1950 gal	Portable vessel
Flocculant	Brine handling	246 lb	15,840 gal	Tank, plastic
Inhibitors	Brine handling	1,584 lb	10,000 gal	Tank, plastic
32% Hydrochloric acid	Brine handling	45,000 lb	32,000 gal	Tank, plastic
Monopotassium phosphate	H_2S abatement	46 lb	500 lb	Portable vessel
Sulfonated Carboxylated Polymer	Cooling tower treatment	141 lb	2,150 gal	Portable vessel
Bio-Detergent	Cooling tower treatment	94 lb	1,658 gal	Portable vessel
12% Sodium Hypochlorite	Cooling tower treatment	7,260 lb	10,000 gal	Tank, plastic
Nalco 1317	Weekly cooling tower biocide treatment	80 gal/week	1,600 gal	Portable vessel
Diesel fuel oil	Diesel fire pump and generators	0	2000 gal	Tank, UL C.S.
Sulfuric acid in station batteries	Electrical/control building	N/A	600 gal	Battery
Various Laboratory Chemicals	Laboratory reagents	Small Amounts	< 5.0 lb	Liquid/Granular
ARI-340, Iron Concentrate Solution	H_2S abatement	16 gal[3]	960 gal	Polyethylene totes
ARI-350 Chelate Make-up	H_2S abatement	16 gal[3]	960 gal	Polyethylene totes
ARI-400 Biochem	H_2S abatement	3 gal[3]	165 gal	Polyethylene tank
ARI-600 Surfactant	H_2S abatement	3 gal[3]	165 gal	Polyethylene tank
45 wt% Potassium Hydroxide Solution	H_2S abatement	16 gal[3]	960 gal	Polyethylene tank

1 All numbers are approximate.

2 Anticipated chemicals.

3 Usage rates derived from vendor recommendation that a 60-day supply of H_2S abatement chemical additives be stored on site.

Table 3.4-1
SALTON SEA UNIT 6 PROJECT
STAFFING SCHEDULE AND CONSTRUCTION WORKFORCE

Construction Schedule Months After Award	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
Geothermal Power Plant (Including Wells and Pipelines)																										
Civil / Sitework Crews								21	21	21	16	14			7	11	14	7					11	11	11	
Concrete Crews									71	104	124	125	77	44	26	6	6									
Structural/Building/Architectural Crews												4	4	31	33	34	18	18	20	24	24	14	9	4		
Underground Mech. and Elect. Utilities Crews									48	70	72	60	33	31	24	18	4									
Mechanical Equipment Crews											7	21	48	50	50	55	55	75	75	60	50	40	30	10		
HVAC / Fire Protection and Insulation Crews																6	9	9	30	47	47	41	58			
AG. Piping Crews										5	15	21	40	67	82	102	118	118	118	100	75	38	25	15		
AG. Electrical Power and Controls Crews													18	36	58	87	95	85	84	82	72	55				
Instrument Crews																		10	20	20	20	17	10			
System Checkout and Startup Crews																		3	9	9	23	36	51	26	13	
Construction Indirect Crews						21	38	34	34	34	34	33	36	37	34	36	34	31	27	24	27	21	21	14	9	4
Construction Staff						32	32	34	39	38	38	45	49	52	52	52	53	55	54	55	54	51	50	42	30	
Engineering Staff (Off Site and On Site)	16	24	33	36	45	45	45	45	45	45	45	38	28	28	23	15	13	12	12	12	12	12	12	8	8	3
Subtotal for Power Plant Site	**16**	**24**	**33**	**36**	**45**	**98**	**115**	**134**	**258**	**317**	**351**	**361**	**333**	**376**	**389**	**422**	**419**	**423**	**449**	**433**	**404**	**325**	**277**	**130**	**71**	**7**
Transmission Line Construction																										
Surveying	9																									
Environmental Resource Surveys and Monitors		10	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6					
Access Layout/Structure Sites/Staging				10	10	8	8				16	16														
Hole Excavation/Foundation/Structure Assembly								36	36	36	36	24	24	24	24											
Shieldwire and Conductor Stringing																34	34	34								
Cleanup/Rehabilitation																			12	24	12					
Engineering Staff (Off Site and On Site)	6	12	12	11	10	9																				
Subtotal for Transmission Line	**15**	**22**	**18**	**27**	**26**	**23**	**14**	**42**	**42**	**42**	**58**	**46**	**30**	**30**	**30**	**40**	**40**	**40**	**18**	**30**	**18**					
GRAND TOTAL PROJECT WORKFORCE	**31**	**46**	**51**	**63**	**71**	**121**	**129**	**176**	**300**	**359**	**409**	**407**	**363**	**406**	**419**	**462**	**459**	**463**	**467**	**463**	**422**	**325**	**277**	**130**	**71**	**7**

Table 3.4-2
SALTON SEA UNIT 6 PROJECT
CONSTRUCTION EQUIPMENT USAGE

Construction Schedule Months After Award (Project is @ 8 hrs./day, 5days/Week)	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**	**26**
Car - Sedan (gasoline, 50% usage)	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
Pickup Truck - 3/4 Ton (gasoline, 75% usage)	7	7	8	8	9	9	10	12	12	14	15	15	15	12	12	12	10	10	5	4	2
Flatbed Truck - 1 Ton (diesel, 80% usage)	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	1	1	1	1
Dump Truck - Tndm.Axle (diesel, 20% usage)	4	4	4	4	2	1															
Concrete Pump Truck (diesel, 30% usage)						1	1	1	1												
Fuel/Lube Truck (diesel, 50% usage)	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
Water Truck - 600 gal.(diesel, 50% usage)	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Forklift - Lull (diesel, 80% usage)	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	1	1	1	1	1
Grader (diesel, 90% usage)	2	2	2	2	1												1	1			
Dozer (diesel, 70% usage)	2	3	3	3	2												1	1			
Trencher / Backhoe 235,710 (diesel, 75% usage)	1	1	1	2	2	2	2	2	2	1	1	1									
Loader - Cat IT 28 (diesel, 80% usage)	1	1	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1			
Paving Equipment (diesel, 85% usage)																		2	2		
Vib.Roller and Walk Behind Roller (gasoline, 60% usage)	1	2	3	3	3	2	2	2	2	2	1	1	1	1	1	1					
Compactor (diesel, 65% usage)				1	1	1	2	2	1	1	1	1	1								
Crane 4100 Series II - 230 Ton (diesel, 70% usage)									1	2	2	2	2	1							
Crane 4000 CWLR - 140 Ton (diesel, 70% usage)						1	1	1	1	1	1	1	1	1	1	1					
Crane RT - 60 Ton (diesel, 50% usage)	1	1	1	1	1	1	2	2	2	2	2	2	2	2	1	1					
Crane RT - 45 Ton (diesel, 50% usage)		1	1	2	2	2	2	2	3	3	3	3	3	3	3	2	2	1	1		
Air Compressors - 185 CFM (diesel, 75% usage)		1	1	1	2	4	5	6	6	6	6	6	6	4	4	2	2	1			
ManLifts / Scissor Lifts (diesel, 80% usage)					1	1	3	7	9	9	9	9	9	8	6	4	2				
Welders Machine - 400 AMP (diesel, 75% usage)	1	1	1	4	6	8	8	8	8	8	8	6	6	4	2	1					
Total Construction Equipment Usage	**25**	**29**	**32**	**38**	**39**	**41**	**46**	**53**	**56**	**57**	**57**	**55**	**54**	**44**	**38**	**32**	**25**	**22**	**13**	**9**	**5**

Table 3.4-3
SALTON SEA UNIT 6 PROJECT
TRUCK DELIVERIES OF EQUIPMENT/MATERIALS

Construction Schedule Months After Award	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**	**26**
Heavy Hauling of Equipment																					
Condenser Equipment									6												
Steam Turbine / Generator Equipment													5								
Main Transformer Equipment									1												
Equipment and Materials																					
Construction Mobilization and Demobilization	25	25	15															10	20	20	20
Consumables / Supplies and Misc. Construction		35	40	45	50	45	45	45	45	45	45	48	48	45	45	35	38	38	38		
Concrete and Rebar				60	184	328	440	200	104	104	81	52									
Miscellaneous Steel / Architectural						12	12	25	35	30	30	30	30	20	20	15					
Steam Turbine / Generator Equipment													10	10	20	29	9	9			
Mechanical Equipment						15	15	35	35	50	50	71	72	44	44	25	15	5			
Piping, Supports and Valves				5	8	10	17	40	62	50	55	47	42	31	16	10	10				
Electrical Equipment and Materials				5	5	10	10	10	20	20	39	39	39	29	20	19	10	10			
Total Truck Deliveries of Equipment	**25**	**60**	**55**	**115**	**247**	**420**	**539**	**355**	**308**	**299**	**300**	**287**	**246**	**179**	**165**	**133**	**82**	**72**	**58**	**20**	**20**

Table 3.7-1
DESCRIPTION OF PROJECT FEATURES TO AVOID OR REDUCE POTENTIALLY SIGNIFICANT IMPACTS

Project Feature	Description
Air Quality	
Fugitive Dust Suppression Plan	Specifies detailed list of control measures to reduce fugitive emissions from construction and operational activities, including but not limited to watering of unpaved roads, vehicle speed limits, windbreaks, transport container covers, cleaning and sweeping procedures.
Well Drilling Compliance Program	Require contractors to obtain SPER or Imperial County APCD permits to minimize air emissions.
Exhaust Emissions Control Program	Specifies detailed list of control measures to minimize exhaust emissions during construction of the project, including but not limited to fuel use, engine maintenance, and procedures.
Well Flow Testing Program	Uses design features, such as well test unit, to minimize the release of particulate matter and metals. Program includes flow rate and duration limits.
Cooling Tower Emission Program	Incorporates LO-CAT technology to control and oxidizers to minimize the emissions of hydrogen sulfide, and carbon adsorber technology to control the emission of benzene. A steam turbine bypass system to route high-pressure steam to the condenser for abatement of NCGs during transient conditions will be included. Mercury and arsine will also be minimized by the series of control equipment. Program will also include drift eliminator. Hexavalent chromium containing compounds will not be used in the circulating water.
Dilution Water Heater Emission Program	Uses design to control and minimize dilution water heater emissions.
Filter Cake Fugitive Emissions Control	Incorporates handling procedures to control the potential fugitive emissions of particulate matter, including direct loading, tarping, and use of sulfate scale inhibitors to minimize Ra226 and Ra228 in the silica filter cake.
Emergency Generators/Fire Pump Emission Control Program	Uses turbochargers with aftercoolers to control emissions from these internal combustion engines. Emergency generators will meet the latest BACT for NO_X emissions and sulfur content in fuel will be limited.
Operating & Maintenance Equipment Emission Control Program	Will control this equipment by meeting any applicable road or non-road 2001 emissions standards and maintaining the equipment with manufactures recommended procedures.
Potential Temporary Emissions Control Program	Will control potential temporary emissions by limiting the operation of temporary sources as much as possible.
Geology	
None	N/A
Agriculture and Soils	
None	N/A
Water Resources	
Water Conservation	Extensive use of steam condensate to minimize water demand from outside sources.
Construction-Phase Erosion Control Plan	An erosion control plan will be used at the site during the construction phase to control sediment-laden runoff and ensure the integrity of the storm water collection system during construction. The plan will use control measures, as necessary, such as grass-covered swales and ditches, stabilized construction entrances, gravel-covered construction lay down area, silt fencing, and seeding of the disturbed area. Specifically, runoff from all affected areas will be diverted to the erosion control measures before discharging off site
HDPE and Concrete-Lined Brine Ponds	Brine ponds will be of earth construction and lined with an HDPE liner and concrete such that the contents will not leach into the soil.

Table 3.7-1 (continued)
DESCRIPTION OF PROJECT FEATURES TO AVOID OR REDUCE POTENTIALLY SIGNIFICANT IMPACTS

Project Feature	Description
Brine Pond Monitoring Wells	Potential release from the brine ponds to groundwater will be assessed with a system of monitoring wells placed around the periphery of the ponds
Perimeter Dike	The entire site will be enclosed by an 8-foot high perimeter dike constructed with 2:1 (horizontal: vertical) sloping sides to protect the plant from flooding.
Storm Water Runoff Drainage Pond	The SSU6 Project site facility will be in a bermed area graded to direct surface water runoff toward an earthen drainage pond designed for 100-year storm conditions. Storm water flows with potential for oil contamination will be directed to an oil/water separator before discharge into the drainage pond.
Production and Injection Best Management Practices	Best Management Practices (BMP) will be developed and implemented for construction, post-construction, and operational phases to maintain the integrity of the drilling fluid handling systems, and run-off.
Casing Shallow Portions of Production and Injection Wells	Casing the shallow portions of the production and injection wells with casings will minimize potential release of both construction-related drilling fluids and production-related geothermal brines to the shallow groundwater aquifer.
Protective Pipeline Design and Detailed Inspection Routine	Production and injection pipelines will be constructed of concrete lined carbon steel, and routinely inspected, to prevent potential releases. Double-walled pipe will be used at the areas of sensitive wetlands.
Pipeline Isolation Valves	Pipelines at each wellhead will be equipped with remotely operated electrical emergency shutoff valves, as well as manual alloy isolation valves to prevent potential releases.
Biological Resources	
Bird Flight Diverters	Will limit bird mortality associated with introducing new transmission lines in bird flyways. Flight diverters make transmission lines more visible to birds.
Avoidance of Drainages	Drainages and riparian areas will be avoided wherever practicable to reduce impacts to sensitive habitats.
Construction Schedule	Construction of well pads adjacent to Yuma clapper rail will be timed outside the breeding season.
Placement of Facilities	Facilities will be placed on developed/disturbed lands wherever practicable to avoid additional impact to sensitive habitats.
Cultural	
Routing	Routing avoids potentially eligible cultural resources site.
Paleontology	
None	N/A
Land Use	
Project Siting	Site was selected that is in the Geothermal Overlay Zone near other geothermal facilities.
Socioeconomics	
Project Siting	Site was selected that is in the Geothermal Overlay Zone near other geothermal facilities.

Table 3.7-1 (continued)
DESCRIPTION OF PROJECT FEATURES TO AVOID OR REDUCE POTENTIALLY SIGNIFICANT IMPACTS

Project Feature	Description
Traffic and Transportation	
None	N/A
Noise	
Steam Blow Silencer	Will reduce sound levels from the steam blow to less than 60 dBA L_{eq} in the noise sensitive species habitat in the Refuge.
Visual	
Structure Color	A tan color will be used on all project facilities where appropriate to blend more naturally with the brown and tan hues within the existing setting.
Fencing	Fencing will be constructed of non-reflective materials or will be treated or painted to reduce visual effects on sensitive viewing areas. Additionally, reflectivity of surfaces will be reduced by using non-reflective elements where appropriate.
Lighting	Lighting on the project site will be limited to areas required for operations or safety, will be directed on site to avoid backscatter, and will be shielded from public view to the extent practical. Lighting that is not required to be on during nighttime hours will be controlled with sensors or switches operated such that lighting will be on only when needed.
Waste Management	
Efficient Landfill Utilization	The Monofill Facility Class II landfill (run by the Desert Company – an affiliate of the Applicant) is dedicated to geothermal brine-related wastes from geothermal power plants in the Salton Sea area owned by affiliates of the Applicant. The bulk of solid waste produced by SSU6 will be sent to the Monofill Facility. This facility effectively minimizes the impacts of solid waste production at SSU6 on local solid waste disposal facilities.
Hazardous Materials	
Secondary Containment	Curbs, berms, and concrete pits would be used where accidental releases of hazardous and acutely hazardous materials could occur. Containment areas would be drained to appropriate collection areas or neutralization tanks for recycling or offsite disposal. Traffic barriers would protect piping and tanks from potential traffic hazards.
Brine Pond Lining	The lining of the brine pond would prevent the interaction of any hazardous materials in the pond with soil and groundwater
Public Health	
Project Siting	Site is in a remote location away from population centers.
Worker Safety	
Fire Suppression System (handcart carbon dioxide extinguishers, fire hydrants/hose stations, sprinkler system, smoke detectors)	Will reduce impacts from fires occurring at the site which, in turn, will reduce potential harm to workers
Adherence to Applicable California Occupational Safety and Health Administration Regulations and Standards (training, written procedures, inspections, design, medical surveillance and monitoring)	Will prevent or minimize potential impacts by the development of procedures, training, physical inspections and the prescription of some minimum standards to design adequate systems. These requirements address numerous worker safety issues including emergency action/evacuation, fire prevention, confined space entry, fall protection, hearing conservation, respiratory protection, personal protective equipment, lock-out/tag-out, electrical safety, excavation and trenching, hazard communication, ergonomics, first aid, bloodborne pathogens, cranes and hoists, vehicle/traffic, chemical exposures.

Table 3.7-1 (continued)
DESCRIPTION OF PROJECT FEATURES TO AVOID OR REDUCE POTENTIALLY SIGNIFICANT IMPACTS

Project Feature	Description
Adherence to Guidance by the State of California, CDOGGR, Publication No. M10	Will minimize risks associated with hydrogen sulfide and geothermal steam during drilling and well construction.
Carbon Canisters for Non-Condensable Gas (NCG) Stream	Will reduce potential worker exposures to benzene.
Job Hazard Analyses (JHAs) for Each Job or Task	Will identify any additional hazards associated with a job or task prior to performing that job or task. This will provide an opportunity to evaluate whether additional measures must be taken to minimize impacts from these potential hazards.
Safety Showers and Eyewash Stations	Will provide a means flushing skin and eyes in cases of chemical splashing, particularly as it pertains to corrosive materials. By providing an immediately available wash station, the contact time and possible injury by these chemicals can be minimized.